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ABSTRACT

The purpose of this publication is to help school district leaders improve the use of technology in schools through the design and implementation of a planning process. Three levels of the process are noted, including strategic planning of overall direction for program improvement, program planning of objectives and management, and curriculum planning, which specifies how technology will be integrated into the classroom. The guidebook is organized around seven major tasks: (1) develop a planning structure and process; (2) establish a direction; (3) develop program plans; (4) create curriculum applications; (5) design the technology support system; (6) prepare for implementation and change; and (7) evaluate performance and effectiveness. Each task is described in a separate section that provides a rationale for the conduct of the task, a description of the process for carrying out task-related activities, exhibits and illustrations of planning activities, and key considerations in carrying out the tasks. A checklist of tasks and steps is included, as well as a glossary of terms and lists of national and state technology planning resource organizations and individuals. References are listed by tasks. (77 references) (DB)

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Ideas and Resources for Educators in New York State

TECHNOLOGY PLANNING FOR IMPROVING SCHOOLS

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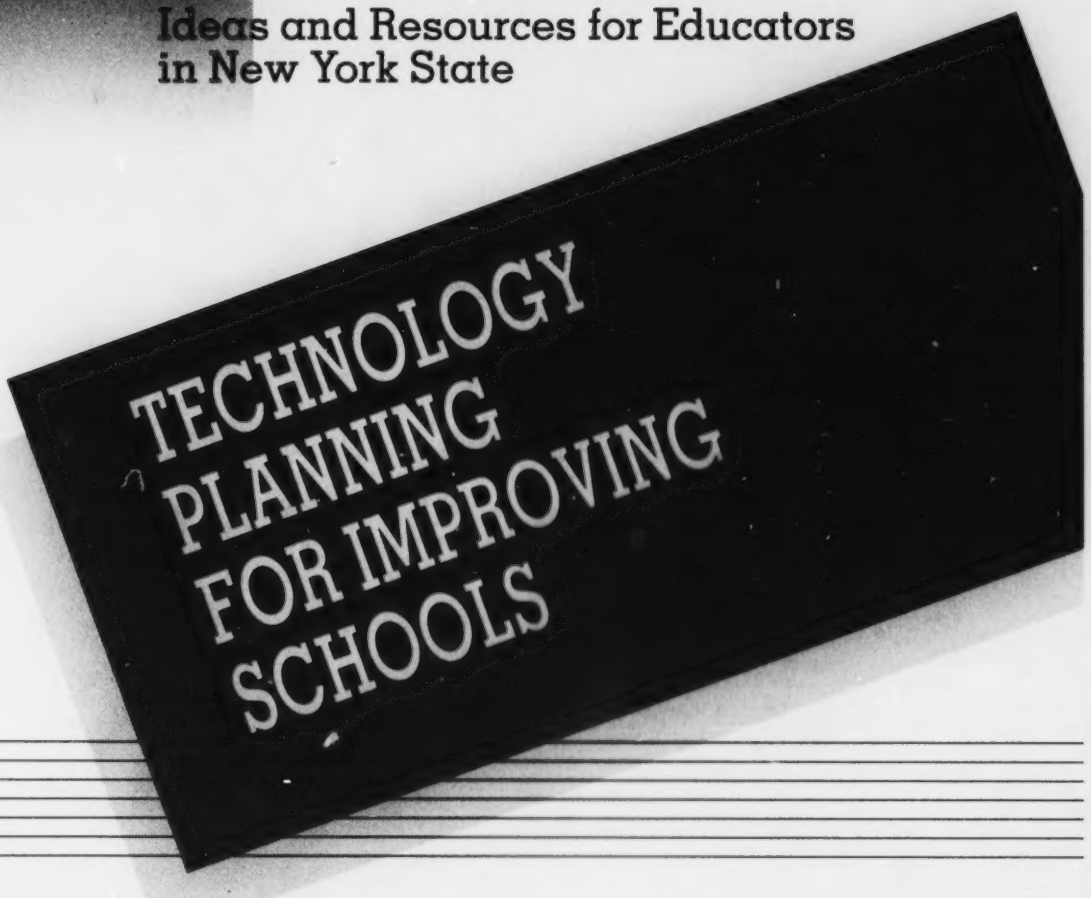
Ideas and Resources for Educators
in New York State



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FOREWORD

New York State's ***Long-Range Plan for Technology in Elementary and Secondary Education in New York State (Long-Range Plan)*** provides direction for local, regional, and State planning so technology can be applied to (1) enhance the teaching/learning environment and (2) improve the management of schools.

In the earliest stages of the ***Long-Range Plan's*** development, field input identified "critical elements" essential to realizing the ***Long-Range Plan's*** "vision" for education. The most important "critical element" identified was "staff development," rated even more highly than "adequate funding." Given this concern for staff development to support ***Long-Range Plan*** implementation, the Office of Elementary and Secondary Education Planning, Testing and Technological Services designed the planning and staff development prototype described in this document.

For many educators, a printed planning document, by itself, may not provide all the help they need to successfully integrate technology into their schools. They may need person-to-person technical assistance as well. We have taken three steps to explore how this technical assistance might best be organized and delivered. First, we invited District Superintendents to send personnel with school improvement and/or technology application skills to formal training on the Technology Planning for Improving Schools (TPIS) approach; this was an extensive, six-day training experience. Because of this training, a TPIS service is now available from several BOCES throughout the State using the COSER process. Second, The Rensselaerville Institute conducted a study of how present Department-supported technology services are marketed and implemented. The latter study concluded that pervasive use of technology in schools must be developed and controlled locally but will also benefit from coordinated regional and state support. Third, a project was funded in the Putnam-Northern Westchester BOCES to pilot the TPIS approach with two school districts whose characteristics and experience indicated they would be well suited to this task. A key consideration was their prior involvement in the Comprehensive Instructional Management System (CIMS) program, because it clearly supports the ***Long-Range Plan's*** emphasis on curriculum-based uses of technology in the teaching/learning environment of our schools. Results from this pilot project, which influenced our thinking about TPIS, are being compiled and are scheduled to be released during the Summer of 1990.

We hope this planning manual will benefit schools that are taking bold steps to integrate technology into their school improvement initiatives. This manual was developed by Dr. Charles Mojkowski, Technology Applications Associates. If you have any questions concerning the use of this manual, contact Steven Kidder at (518) 486-6074 or SKIDDER on PROFS on the Technology Network Ties statewide telecommunications system.

John J. Murphy
Assistant Commissioner for
E & S Education Planning, Testing
and Technological Services

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INTRODUCTION

Many school districts are at a crossroads in their uses of computers and related new technology tools. Despite a substantial increase in the amount of hardware and software available, educators are not realizing the impact on student learning they envisioned. In many cases, the shortfalls are not attributable to ineffective hardware or software, but to the lack of a comprehensive plan for linking technology applications to school and program improvement priorities, and for failing to use technology applications to catalyze and support a transformation of learning outcomes (the curriculum), teaching and learning, and program management.

Numerous reports of technology use in schools have found the lack of adequate planning and the lack of plans to be major contributors to these unrealized expectations. Most technology plans focus on hardware and software selection, failing to present a strategic and comprehensive view of a technology-supported transformation of teaching and learning. It is not uncommon for a district to have spent hundreds of thousands of dollars on computers and other components of a technology support system (TSS) * without first having developed a curriculum-based plan for their use. Most often, districts do not define a strategy for bringing about the transformation of curriculum and instruction using technology as both a catalyst and support. Without such a strategic approach, technology applications, even whole "technology curriculums," have been developed on the periphery of mainstream school and curriculum improvement. Many of these technology curriculums are unrelated to the content area curriculums which they purport to serve. The lack of coordination between the two results in piecemeal and episodic integration efforts.

Most plans focus on hardware and software selection, failing to present a strategic and comprehensive view of a technology-supported transformation of teaching and learning.

The purpose of this publication is to help school district leaders improve the use of technology in the schools through the design and implementation of a comprehensive structure and process for planning a technology support system that is linked to the district's overall school improvement efforts. This guidebook deals not just with the development of a plan, but with the application of an ongoing planning process. The guide will help school leaders establish a technology planning process that will ultimately change the way they use technology to support school and program improvement.

Because the technology support system is not a program but a set of coordinated human and material resources and processes, a plan for its development cannot be accomplished without reference to that which it is intended to support. The TPIS planning approach requires that planning for the development of the technology support system be an integral component of district-wide school and program improvement planning. Technology planning that is unconnected and unresponsive to the school and program improvement process runs the risk of creating a technology system and technology applications that operate at the periphery of the organization. Similarly, if school and program improvement planning is conducted without attention to the integration of a technology support system and applications, such planning is likely to result in curriculum and instruction which does not adequately prepare students for real world learning and work. Technology tools are essential to accomplishing the outcomes of a revitalized curriculum and to achieving an increased

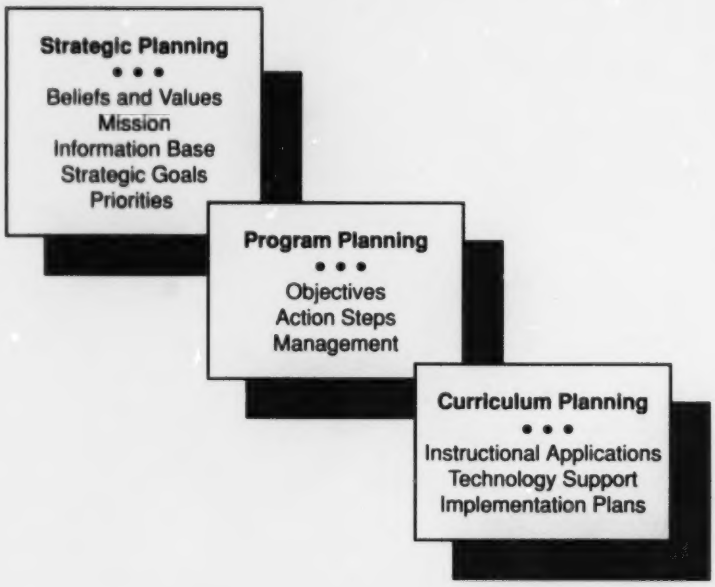
*A glossary of terms is provided in the Appendix.

productivity and effectiveness for all members of the school learning community — students, teachers, and administrators.

The TPIS planning process employs three different levels and types of planning (Figure 1).

- **Strategic planning** processes help the district establish overall direction for school and program improvement.
- **Program planning** helps the district translate the broad direction into program plans focused on priorities for development and improvement.

Figure 1
Levels of Planning



- **Curriculum planning** helps the district specify how the technology tools and applications are integrated into a revitalized curriculum and teaching and learning process.

This guidebook translates these three planning processes into seven major tasks, each with several steps (Figure 2). Task 1 deals with organizing the planning process and involving the key stakeholder groups in the effort. Task 2, the essence of the strategic planning process, is concerned with establishing an overall direction for the development of the technology support system **within the context of the district-wide school improvement process.** The strategic planning process includes:

1) developing statements of beliefs and values, and mission;

2) reviewing the information base, both external and internal, to the district;
3) developing strategic goals; and
4) establishing priorities for school and program improvement.

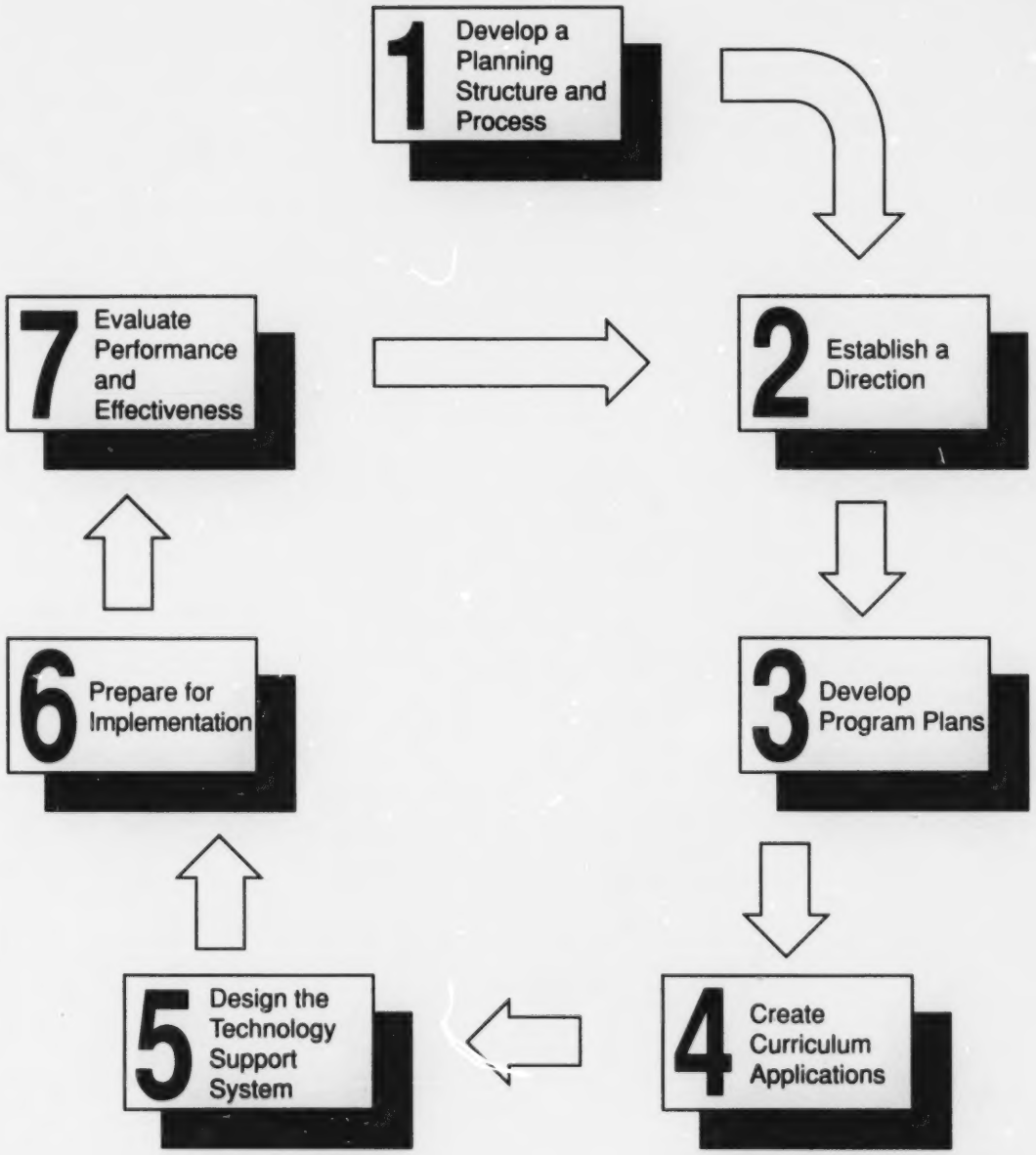
Using these priorities, the planning team can move ahead to Task 3, program planning, during which the broad design for improvement is created. Program plans are essential for translating strategic goals and overall direction into program initiatives. These plans help to focus limited resources (e.g., time, staff, and materials and equipment including technology tools) on core improvement objectives, rather than on a diffuse collection of initiatives.

Program plans are essential for translating strategic goals and overall direction into program initiaitves.

Tasks 1-3 establish the broad context in which the technology support system needs to operate. While they are not focused on technology per se, they include attention to how a technology support system and technology applications generally support improvement goals the district will pursue.

Tasks 4 and 5 are integrally related, often conducted simultaneously. Task 4 deals specifically with curriculum planning, particularly with the development of curriculum-based technology applications for use in classrooms. This third level of planning brings the influence of the mission and strategic direction and program improvement priorities to curriculum and teaching and learning. Task 5 is concerned with the development of the technology support system itself, dealing not only with hardware and software, but with all of the resources and procedures that make it a support system rather than just a collection of equipment. Tasks 6 and 7 address, respectively, implementation and evaluation in greater detail than is provided in the program plans (Task 3). Their importance requires that the planning team deal with them as formal components of the overall TSS plan.

Figure 2
The TPIS Planning Process


1 Develop a Planning Structure and Process
2 Establish a Direction
3 Develop Program Plans
4 Create Curriculum Applications
5 Design the Technology Support System
6 Prepare for Implementation
7 Evaluate Performance and Effectiveness

The district planning team needs to remain flexible in its planning process and in the presentation of its program plans. Because of rapidly changing circumstances, little definitive information about what works, and a general uncertainty about futures, the plan should be viewed as a process, not an event, providing the district and its several stakeholder groups with an opportunity to learn about what works within a well-grounded framework. A central component of TPIS that results from a focus on strategic as well as program planning is the emphasis on the involvement of many stakeholder groups throughout the process. While the type and level of their involvement varies throughout the planning process, the planning team needs to build a strong program of two-way communication to secure understanding and commitment from stakeholders regarding the key elements of the plan.

■ *The planning team needs to build a strong program of two-way communication to secure understanding and commitment from stakeholders regarding the key elements of the plan.*

The TPIS process helps district staff to develop a strategic sense and an approach to using technology that is guided by the district's vision, mission, and goals. The resulting plan addresses not only the district's priority outcomes (e.g., improving thinking and learning-to-learn skills, developing science skills, and fostering reflective problemsolving), but the teaching and learning environments that the district wants to establish (e.g., real-world learning tasks, cooperative learning, competency-based assessment).

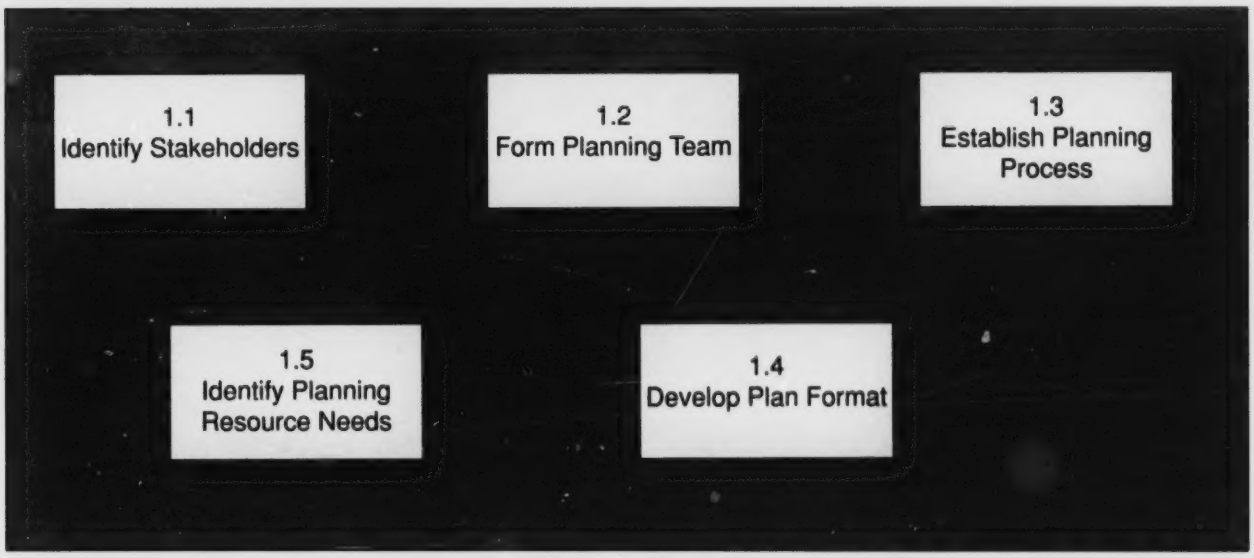
The planning process incorporates understandings about the change process and builds these understandings into the plan. Program plans are implemented incrementally, but within the grand design shaped by the district's mission, goals, and priorities.

This guidebook is organized around the 7 tasks and 28 steps that are required to implement the planning process. Each task is described in a separate section which provides:

- a rationale for the conduct of the task;
- a description of the process for carrying out the specific steps related to the task;
- exhibits and illustrations of essential planning activities and documents; and
- key considerations in carrying out the tasks.

The ***Plan Outline*** serves as a companion to the guidebook. A bibliography of references and resources is provided at the back of the guidebook, together with an Appendix containing a glossary of terms and information on national and state technology planning resources.

TASK 1: DEVELOP A PLANNING STRUCTURE AND PROCESS



RATIONALE

An investment of time and energy in setting up the planning process not only yields substantial dividends in the quality of the plan, but builds a community of committed advocates that will continue to benefit the district and the technology support system through all the years of the plan's implementation. Task 1 addresses the procedures for establishing a district-wide planning process and creating an organizational structure for developing and implementing the plan. District leaders need to decide what process will help them achieve the desired outcomes:

- clear direction for improvement and growth, with a focus on the learner;
- a sound design for developing and improving the technology support system and technology applications; and
- the support of the staff and the community.

Many plans are not useful or even used because the planners overlook one of the principal benefits of planning: the involvement of key stakeholders. Planning is learning: an ongoing process, not a series of events. Its focus is as much on creating a learning community and developing a consensus about mission and goals as it is on the preparation of a document. The process requires commitment by district leadership to a continuing renewal of plans and programs.

■ *Planning is learning: an ongoing process, not a series of events.*

The selection of a planning process is equally as important as the identification and involvement of key stakeholder groups and individuals. Different planning approaches and processes can lead to the development of very different plans. Some planning models, particularly

those focused primarily or exclusively on a technology system or technology applications, begin with a simple needs assessment. Starting at this point, however, runs the risk of neglecting the broader contexts in which the technology support system must operate and the ends it must serve. Therefore, the TPIS planning process begins with developing a strategic sense that informs the development of program planning and leads to the development of specific instructional applications. Without all three levels of planning combined into a structured but flexible process, the team is likely to produce a narrow document that does not address the core improvement priorities of the district and schools. Many districts and schools in New York and throughout the country are engaged in school and program improvement planning that addresses such priorities. Most school improvement models include attention to improvements in learning outcomes, instruction, and management. In New York, the Regents' Excellence and Accountability Program requires such attention from all schools.

...the TPIS planning process begins with developing a strategic sense that informs the development of program planning and leads to the development of specific instructional applications.

ACCOMPLISHING THE TASK

Step 1: Identify key stakeholders.

The planning team needs to identify those groups that should be represented in the planning effort and, within those groups, the significant persons who will need to be consulted and/or involved as the plan is developed. Key stakeholders include teachers and administrators, particularly those who have been involved in curriculum-based technology planning and development efforts such as the CIMS and Model Schools Programs,* parents and students. In addition, there are persons who have an important stake in the operation of the schools—persons from government, social service agencies, business and civic groups. Typically, the superintendent will be responsible for assuring that all significant stakeholder groups are represented and involved in the planning process.

In identifying key stakeholders, it may be helpful to address the following questions:

- Who has been or could be instrumental in designing and implementing the technology support system?
- Who is involved in school or curriculum improvement activities?
- Who is planning staff development activities?
- What noneducators need to be involved?
- In what activities?
- How can they make a contribution to the work?

Key stakeholders include teachers and administrators, particularly those who have been involved in curriculum-based technology planning and development efforts such as the CIMS and Model Schools Programs...

Step 2: Form a planning team.

While there are many people who need to be involved in the development of a plan, it may be more productive and appropriate for a small team of individuals to actually write the plan. The superintendent will need to designate this planning team simultaneously with identifying all of the stakeholder groups and individuals who are to be involved. The stakeholder groups can be responsible for providing ideas before the

*A glossary of terms is provided in the Appendix.

writing and reviewing drafts of each component. This process provides the best combination of quick development of the document and high levels of interaction around the drafts. The superintendent should appoint a coordinator who will serve as the leader of the planning team and the coordinator of planning activities, particularly those concerned with involving stakeholders in the process. The superintendent should also demonstrate strong commitment to the planning process through active involvement and leadership. The school committee needs to demonstrate similar commitment.

The superintendent and the planning team need to decide what types of involvement are appropriate to achieve the essential investment and commitment of important groups and individuals. Some districts form two groups with overlapping membership: a) a plan development group, and b) a school improvement advisory group. The first group usually deals with the details of plan development and implementation; the latter group usually deals with the broader issues of design, such as goals and strategies. Some districts have a standing advisory group that addresses all school improvement programs. Experience indicates that planning which combines leadership (motivation and support) from the top ("top-down") with meaningful involvement from teachers ("bottom-up") yields the strongest plans and commitment for implementation.

■ *Experience indicates that planning which combines leadership from the top ("top-down") with meaningful involvement from teachers ("bottom-up") yields the strongest plans and commitment for implementation.*

In selecting the planning team, the superintendent should be sure that the team members are aware of the need for the plan and have the collective experience and talent to develop one. A technology specialist should serve as a member of the writing team to deal with the issues related to the development of the technology support system. This person should be aware of the most pressing issues related to technology applications in the schools. No one individual need have all of the expertise required, but the team should have it, or be able to tap ad hoc expertise as required. The planning team should also be aware of regional (e.g., BOCES and Regional Information Centers) and State (e.g., New York State Education Department, Office of Elementary and Secondary Education) resources and services.

Step 3: Establish a Planning Process

In deciding on the planning process, the team can draw on this guidebook and particularly on Figures 1 and 2 in the Introduction for material that explains the process that will be used. The team should adapt this process to accommodate its own needs and circumstances.

If planning is learning, then the team will need to be very clear on the outcome it expects from the planning process. The team should prepare a brief abstract — a one page description of the intended outcomes and the planning process it will use. The team may want to draw on some of the material in the introduction to this guidebook in developing the description. The abstract should be disseminated widely, so that the various stakeholder groups, staff, and community members, understand the planning process and outcomes.

■ *If planning is learning, then the team will need to be very clear on the outcome it expects from the planning process.*

The planning team needs to decide how it will proceed with the planning. When will the members meet? What needs to be accomplished during the first few meetings? How will they organize people around planning objectives and tasks? Who will be responsible for what?

A key element in the planning process is two-way communication. The team should address these questions:

- How has information about the connections between school and program improvement and the technology support system and technology applications been introduced in the district?
- What concerns do teachers and administrators have about technology and how are they being addressed?
- What means are available for members of the school community as well as the larger community, to communicate with the planning team?
- How will the outcomes of planning meetings and other activities be communicated?
- How will the planning process and its outcomes be communicated to all stakeholders?

Information can be disseminated through newsletters, principals' meetings, newsletters to parents and teachers, broadcast media, open house sessions for parents and stakeholder involvement in planning meetings.

Step 4: Establish a format for the plan

Although the ongoing planning process is important, the plan itself is no less so. Figure 1.1 provides a suggested content and a format for the plan. The planning team should review that outline at this point and make whatever preliminary modifications they wish. Whatever outline is developed at this early stage is likely to be modified as the planning process proceeds.

Figure 1.1

Suggested Plan Outline

Executive Summary
Introduction
Future Directions
  Values and Beliefs
  Mission Statement
  Review of the Information Base
  Setting a Course
Proposed Programs
Curriculum Applications
Technology Support System Requirements
Implementation Plans
Performance and Effectiveness Evaluation

Step 5: Identify planning resource needs

■ *Essential planning prerequisites: commitment, communication, and collaboration.*

The planning team will need resources in order to conduct its work. The team will need to be given time, either during the school day or after school, to conduct the planning process and to produce the documents that are part of that process. The team will also need information of a variety of types. This information will be delineated in the following

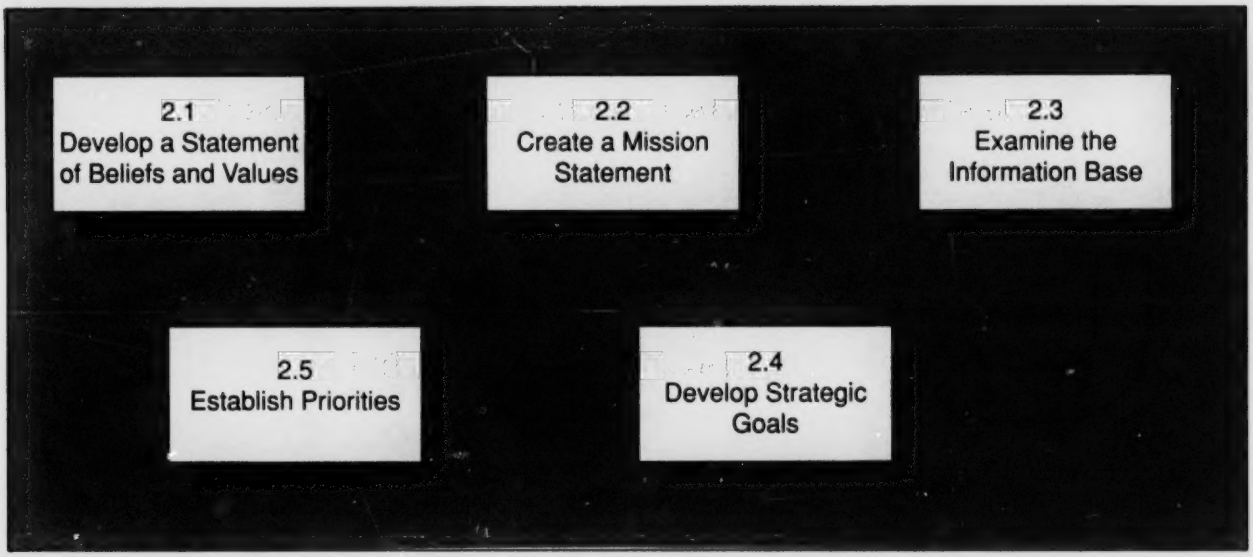
section dealing with establishing a direction. The team will need assistance from the superintendent and other district level people in order to put together the information base it needs.

The team might also need external experts and consultants for specific tasks and steps in the process. Finally, the team will need some logistical and material support. It may need to purchase documents, have materials copied and get documents typed. While these needs seem rather mundane, they are essential to the process.

CONSIDERATIONS

- While drafting the plan itself may not take much time, there are some tasks that will take more than others. The internal scanning and the analysis of the information that results from that process will require a considerable amount of time. The planning team may want to establish a subcommittee that begins immediately on that job, even before the mission and belief statements are developed. The planning team should consider the use of ad hoc groups to accomplish very specific tasks in the planning process rather than several standing committees.
- Perhaps the most time consuming aspect of the entire process is building involvement, that is, including all of the stakeholder groups and individuals in the review and building commitment to the plan. Time must be invested in educating others and building commitment to the vision that the plan represents.
- The planning team should disseminate drafts of various components of the plan in stages in order to bring people into the process early on, rather than waiting until the plan is completely done. By setting up frequent two-way communications processes, the planning team can receive immediate feedback to various components of the plan and make adjustments as it proceeds.
- In those districts where there is no school or program improvement process in place, technology advocates may wish to develop a technology support system plan on their own. This approach may be successful **if the process reflects what directions should be made in curriculum and instruction.** Most often, however, such independent planning is severely compromised without strong connections to district-wide school improvement planning. In most cases, technology advocates might better invest their energies in promoting the initiation of a school improvement process which can then serve as the "agenda" their technology resources will address.

TASK 2: ESTABLISH A DIRECTION



RATIONALE

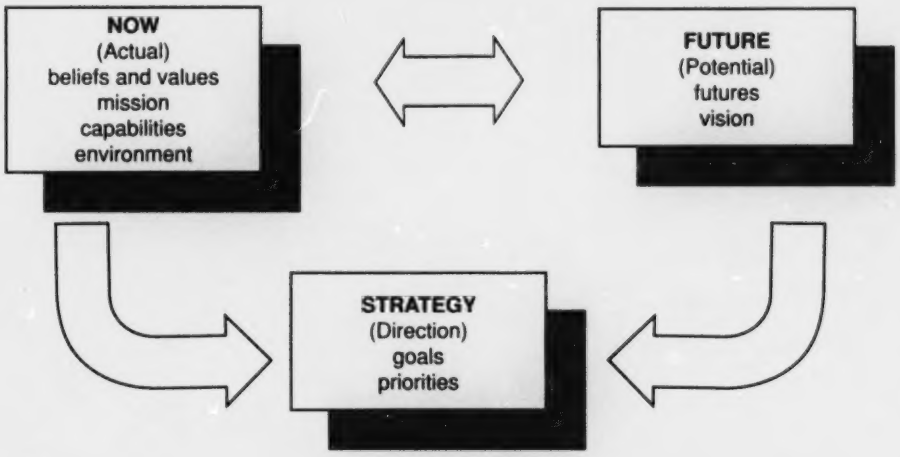
Developing a consensus on beliefs, values, mission, strategic goals, and improvement priorities provides the planning team and district leadership with an opportunity to signal to the staff and to the community the general scope of the transformations that need to take place with respect to curriculum, teaching, and learning. The vision of what the school and community want for all of their children should include attention to how technology influences and contributes to that vision.

Establishing a strategic direction for the technology support system requires determining where the district is presently and where the district wants to be in the future. This requires the development of:

- a **statement of beliefs and values** (or philosophy) that guides the selection of new directions and improvement opportunities,
- a **mission** stating the major purpose of the schools,
- an **expanded information base** to support decisions about new directions and needed program improvements, and
- a course of action, including **strategic goals** and **priorities** for program improvement (Figure 2.1).

Each of these products of the planning process can include references to the role of technology in curriculum and instruction.

Figure 2.1
The Strategic Planning Process



The primary reasons for developing these statements are to:

1) Provide the foundation and framework for all program and curriculum planning.
2) Provide direction to teachers and administrators responsible for transforming and revitalizing learning outcomes, instructional strategies, and program management.
3) Make clear statements to the staff and community about the basic beliefs of the district regarding the use of technologies for supporting school and program improvement priorities.

Strategic planning which includes considerations about the appropriate role of technology helps a district to create a better match between the technology support system as a means and district improvement priorities as the ends. Such planning also helps the district to assess its internal strengths and weaknesses, and make decisions about broad directions for development and improvement. The process promotes a positive approach to change. It extends beyond traditional needs assessment by examining the larger context in which those needs exist. It recognizes that changes in society (many brought about by the very technologies the plan will address) will require a citizen and worker with different capabilities than are required now. The process focuses on opportunities to be pursued as well as on problems to be solved.

ACCOMPLISHING THE TASK

Step 1: Develop a statement of beliefs and values.

This first step in the planning process provides an opportunity to listen to the views of the several stakeholder groups and individuals who wish to contribute to the district's strategic plan. The planning team should conduct open forums in which the faculty and members of important constituency groups share their statements of values regarding the kind of student they wish to graduate and consequently the kind of curriculum and teaching and learning experiences the schools will need to provide. The planning team will need to promote attention to how technology supports their basic beliefs and values.

The planning team may develop a few sample statements to stimulate discussion at the forums. In general, these forums should be for listening to ideas, rather than debating points of view or making decisions. The team should focus the discussions on the role that schools must play in achieving the society we want and the young adults we need to graduate from our schools in order to create that society. Attention should be given to the contribution that technology will and can make to our society and to the development of successful citizens and workers. The team should use the outcomes of the forum in drafting a concise statement of beliefs and values. Figure 2.1 contains selected beliefs and values statements. **The Long-Range Plan for Technology in Elementary and Secondary Education in New York State** contains material on the role of technology in pursuing excellence in schools.

■

Attention should be given to the contribution that technology will and can make to our society and to the development of successful citizens and workers.

■

***The Long-Range Plan for Technology in Elementary and Secondary Education in New York State** contains material on the role of technology in pursuing excellence in schools.*

Step 2: Create a mission statement.

Based on the statement of beliefs and values created in Step 1, the planning team should draft a mission statement. The statement should be concise and written to communicate effectively to a wide audience. The team may want to draft a few statements, or invite drafts from interested individuals. These statements can be disseminated and a meeting can be held to select those statements or pieces of statements that have the consensus of the team. Once a consensus statement is created, the team should disseminate it and the statement of beliefs and values for widespread review and comment by all of the stakeholder groups (see Figure 2.3).

Sample Beliefs and Values Statements **Figure 2.2**

To live and work successfully in our global society, graduates of our schools will require different knowledge, skills, and attitudes than previous generations.

To help create the society we want, young adults will need to know how to learn in rapidly changing work settings, how to solve problems and make decisions in an information rich but knowledge poor environment, and how to communicate and work with an increasingly divergent peer group.

Figure 2.2 continued

The knowledge and skills demanded of those young adults will in turn place different and expanded demands on the schools. New sets of learning outcomes will need to be addressed, and whole new teaching and learning environments will need to created. The organization of schools themselves will need to appreciably changed.

Technology tools and applications will play an increasingly important part in the transformation of schools, both as extensions of the mind and senses, and as productivity tools.

Figure 2.3

Sample Mission Statement

Our schools will educate all of our children to be learners and problem solvers, able to seek and e information and to communicate effectively to pursue real-world learning and work.

Step 3: Examine the information base.

Information is the lifeblood of the planning process. Information increases the understanding of the planners and the stakeholders about all of the contexts in which the schools will develop and operate. These contexts, or environments, are both internal and external to the district. Analyzing the internal environment ("looking inside") requires a review of existing and anticipated strengths and weaknesses of the district's existing programs and its organization, including the technology support system and technology applications. Analyzing the external environment ("looking outside") requires a review of existing and anticipated opportunities and threats presented by events and conditions in society in general,and in work and the economy, schools and the new technologies themselves. The "map of the territory" or environment (external and internal) must be based on information from research and evaluation, theory and practice.

■
Internal Information
- *strengths*
- *weaknesses*

External Information
- *opportunities*
- *threats*

Internal Systems Information

The planning team needs to build a profile of the district, gathering and organizing data on the performance of students and the organization itself. There is likely to be ample data available on traditional outcome measures such as reading, mathematics, and related basic skills. Information on outcomes that are equally if not more important — learning-to-learn, problem-solving, and thinking-reasoning skills; attitudes and values — may not be as readily available. The planning team should organize what is available and note for the future the kinds of information that will need to be collected to inform staff and the community about school and student performance regarding new goals.

The planning team also needs current information on the strengths and weaknesses of the technology support system and existing applications. The **Technology Support System Assessment Guide** will help the planning team to collect useful data for determining internal strengths and weaknesses. The technology audit guide assesses planning

and applications against 41 indicators or standards in 7 areas: planning process, technology competencies, instructional strategies, resources, staff development, management, and evaluation. The inventory forms help to organize information about hardware, software, technology applications and staff competencies to indicate to the team not only what resources are available, but where they are located and what they are being used for.

Information about teachers' attitudes and perceptions about computers and other technology tools can be useful to the team in assessing levels and types of concerns and dispositions. This information can help the team to plan appropriate change strategies and tactics for implementing new programs which incorporate technology (see Task 6 for more information on the implementation and change process).

■ *Assessing the Technology Support System:*
- *audit*
- *inventory*
- *attitudes*

External Environment Information

Information about trends or issues that will impact on the schools and on the development and use of technology is essential. Of particular importance are such trends as the shifting demographic profile of students and their families, the increasing global perspective of society, rapidly changing social, economic and environmental conditions, the changing nature of work, the information explosion, and the increasing sophistication and decreasing cost of technology. Analysis of these trends can indicate where new competencies need to be addressed or existing ones need to be modified. Some of the key questions that need to be addressed are:

- What will society be like in the 21st century?
- What competencies (knowledge, skills, and attitudes) will young adults need in order to succeed in, and contribute to, that society?
- What must the schools do to provide their students with these competencies?
- What do people outside the schools do with technology when they learn, work, and perform in real-world settings?
- How will these people perform differently in the future?

■ *What do people outside the schools do with technology when they learn, work, and perform in real-world settings?*

In most cases, the external environment impacts all schools in much the same way. Therefore, the planning team need not develop a profile of external conditions on its own. Excellent syntheses of these conditions are available at the national and state levels. The Bibliography contains references on national conditions. The New York State Education Department and the BOCES can provide State and even regional perspectives. State professional organizations (teachers, administrators, school boards) produce material that addresses changing conditions and futures perspectives. Local organizations such as the Chamber of Commerce and the United Way often compile community-level data.

Planning team members need to respond to such questions as:

- How does this information help the district to identify opportunities and threats?
- How can the district take advantage of the opportunities and mitigate the threats or turn them into opportunities?
- What are the implications of this external conditions analysis and futures perspective for the ways schools should incorporate technology?

- What changes are needed in learning outcomes, instructional strategies, and program management in order to best prepare our students?

The planning team needs to summarize this examination of external and internal information and prepare reports that can be disseminated to staff members and other stakeholder groups involved in the planning. These reports can be used to help all those involved in the planning develop some common understandings about the context in which they will develop new programs and services for students. Figure 2.4 contains selected items that might result from examining internal and external information bases.

Step 4: Develop strategic goals.

Based on a foundation consisting of beliefs, values and mission, and with an expanded base of information, the planning team should prepare a set of strategic goals for guiding the future development and growth of the district. These goals should serve as the focus of school and program improvement plans and guide the development and use of the technology support system. In developing these goals, the team should consider setting up some predrafting activities that will involve a wide number of the staff and other individuals involved in the planning process. Typically, the development of these goals is informed by the creation of a vision of the schools as the planners hope or imagine they will

Figure 2.4

Conditions in the Environment

Internal:

Strengths
- technology competencies well delineated
- heavy emphasis on tool applications; all graduates able to use word processor
- strong commitment to staff development; over 85 percent of staff have had awareness training; 60 percent use computer in their professional work
- excellent inventory system
- adequate numbers of computers for existing level of applications

Weaknesses
- integration of technology competencies in only a minority of classrooms
- inadequate information about student performance on technology competencies
- curriculum in some areas still traditional; does not allow for appropriate integration
- inadequate equipment and software to support essential technology competencies (modems and communications software)
- linkages between school and curriculum improvement and technology applications tenuous

External:

Figure 2.4 continued

Opportunities
- explosion of information; too much information rather than not enough; decision making impeded rather than facilitated
- rapid changes in skills required for most jobs; increase in learning on the job (learning will be the work of the 21st century)
- increasingly sophisticated technologies (e.g., voice recognition, artificial intelligence and expert systems, computers emulating human senses)
- access to information more widespread and equitable

Threats
- multiple access to nonschool based learning resources
- learning environments less space, time and resource bound

exist in the distant (i.e., 7-10 years) future. Visioning activities usually are not based on information obtained through internal and external scanning processes. Instead, visions are based on desired, even imagined, futures that planners and their constituent groups develop about the way they believe schools will serve children and society.

Visions are based on desired, even imagined, futures that planners and their constituent groups develop about the way they believe schools will serve children and society.

There are many ways in which the development of vision statements or the conduct of visioning activities can be carried out. It is important to allow all interested parties to develop alternative futures based on their desires about the way technology will be used in school districts, and to provide opportunities for these visions to be shared and articulated among the participants.

The outcome of this process should be a set of statements about a desired future in which the schools prepare children to succeed in, and contribute to, a productive society and economy. Some of the statements should address the role of technology in that future. Specifically, how will a technology support system and technology applications contribute to the mission and visions of the school district? If the district's statements are focused on the young adults we wish to prepare for future learning and work, then the statements on technology must reflect that student-centered perspective.

If the district's statements are focused on the young adults we wish to prepare for future learning and work, then the statements on technology must reflect that student-centered perspective.

These statements should then be used by the planning team to develop a set of strategic goals. If the vision constitutes a desired destination, it's possible to think about the district's strengths and weaknesses (including those of the technology support system) as determining what its capacities are for moving toward that destination. The mission and goal statements describe the ways in which the district would like to accomplish its vision, and the scan of the external environment provides information on what likely conditions will need to be addressed as the district moves forward. Figure 2.5 provides samples of strategic goals for school improvement and the technology support system. The planning team should disseminate the list of strategic goals to all stakeholder groups, inviting review and comment, and refining them based on the reviews.

Step 5: Establish priorities.

It is unlikely that all of the goals identified can be addressed at once or with the same level of intensity. Some may require several years and substantial resources. The planning team needs to decide which goals it will address immediately, that is, in the current or next school year and which it will address later. The planning team may decide it wants to address all of the goals immediately, but with different levels of resources committed to each according to its importance. To set priorities, the planning team should first establish a set of criteria. Figure 2.6 contains a set of criteria that are appropriate at this stage in the planning process. More specific criteria can be used during program and curriculum planning.

Figure 2.5

Strategic Goals for School Improvement and for the Technology Support System

School Improvement

- Integrate the teaching of learning-to-learn, problem-solving, information and communication skills in every subject area.
- Employ real-world learning activities in all subject areas.
- Improve the quality and scope of assessment.

Technology Support System

- Develop an infrastructure of technology support that provides teachers, administrators, and students with productivity tools and tool skills in order to be more productive teachers and learners.
- Use technology that best approaches real world tool applications in such areas as information access and use, problem solving, and communication.

Figure 2.6

Selected Criteria for Priority Setting Among Strategic Goals for School Improvement

Importance of Goal to District's School Improvement Plan. How much does the goal contribute to the district's improvement priorities?

Impact on Performance/Productivity. What is the predicted gain in student performance from implementation of this goal? What is the predicted gain in teacher productivity and effectiveness?

Cost/Benefit. To what degree are projected resource requirements for the strategy in proportion to predicted benefits?

Equity. How does the goal improve equality of educational opportunity?

Future-Orientation. How does this goal make possible new curriculum and approaches to teaching and learning? How does the goal address predicted future trends and anticipated educational needs?

Technical Feasibility. What technology is available to support this goal?

Figure 2.6 continued

School-based Adaptability. Does the strategy allow for adaptation by schools to meet their individual needs?

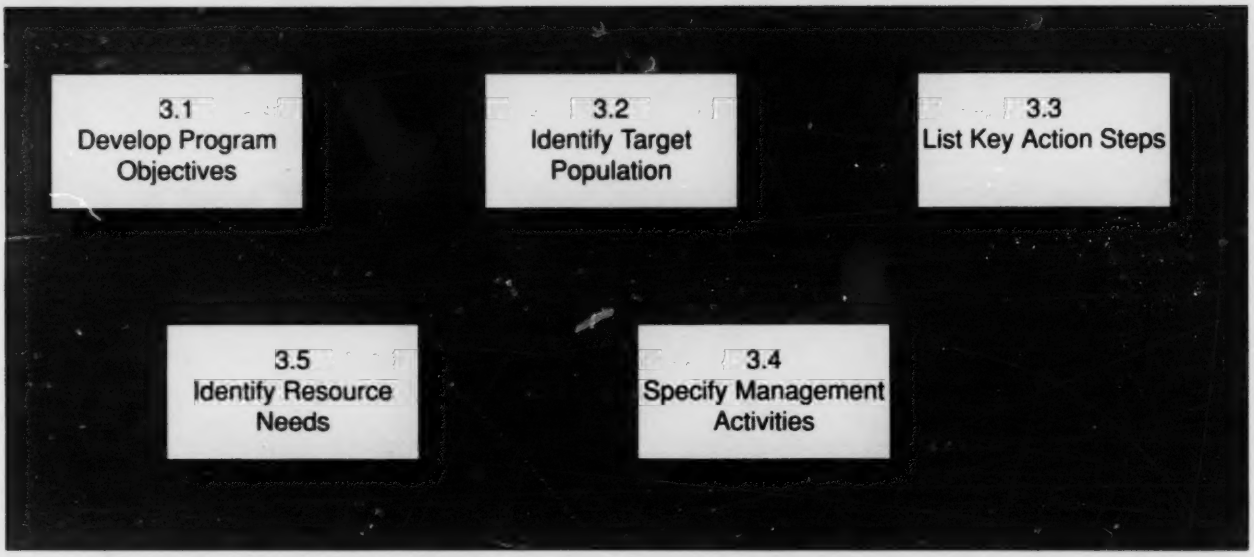
Population Affected. What is the size of the student or teacher population affected?

With the determination of district priorities, the broad destination, routes of travel and means of transportation are decided. The team now has a course of action for guiding its development of program and curriculum plans, and for designing and implementing curriculum-based technology applications.

CONSIDERATIONS

- Completing Task 2 will likely require a greater degree of stakeholder involvement than any of the remaining tasks. The public must be involved in establishing broad destination and direction; teachers and administrators must then decide on the means.
- The strategic planning process is broader than traditional planning for technology support systems and applications. The process requires that the planning team expand its vision and understanding of the contexts in which it is working. Such a perspective is necessary to avoid remaining within outmoded paradigms or continuing strategies that either have not worked well or have not been directed to important district priorities.
- The strategic planning process requires an extensive range of information. In many cases the planning team will not have all of the information it needs or wants. Nevertheless, they will need to make decisions based on what information is available and note the need for new or improved information to guide future planning. This is particularly the case with respect to information about the internal system. Many districts do not have a sufficient quantity or quality of information about student performance on technology competencies or even on the important core skills such as learning to learn, problem-solving and information processing. Improving this information base is essential to improving planning for school improvement with and through technology.

TASK 3: DEVELOP PROGRAM PLANS



RATIONALE

A program is a coordinated set of activities and resources focused on the accomplishment of a specific objective or set of objectives. Program planning translates the strategic direction established in Task 2 into detailed plans for addressing the goals and priorities established through the strategic planning process. A program plan has the following components:

- Objectives
- Target population (which students, teachers, and administrators will be affected?)
- Action steps
- Management requirements
  - staff
  - staging and phasing
  - facilities
- Resource requirements

Typically, programs are focused on broad subject areas such as reading or science, but a program might also be focused on a management function such as staff development or a target population of students such as at-risk students. In school and program improvement, most program objectives are focused on broad student learning outcomes. These broad outcomes are translated into specific student learning outcomes as part of the curriculum development process in Task 5. Since the focus of the TPIS process is on curriculum-based technology applications, program planning sets the stage for new developments or

improvements that are supported by a technology support system. Detailed planning of the technology support system is addressed in Task 6, but broad system design considerations often can be considered at this stage, as priorities are established.

In New York, districts and schools are required to establish program improvement plans to address essential student outcomes and to report progress on a regular basis. Many schools and districts are implementing formal school improvement programs based on the school effectiveness and organizational development research. These improvement processes serve as a natural focus for the technology support system.

ACCOMPLISHING THE TASK

Step 1: Develop program objectives.

The planning team should develop several program objectives for each of the goals and priorities established through the strategic planning process. These objectives should be broad statements that focus on desired outcomes for students. Some examples of program objectives are:

- Improve students' information skills in all subject areas.
- Improve students' problem-solving skills in all subject areas.
- Expand students' experience with real-world learning and work tasks.

Each of these objectives will ultimately need to be supported by a detailed scope and sequence of student learning outcomes in order to guide the development of an instructional program. The specification of detailed student learning outcomes or competencies (including technology application skills) and instructional strategies (including the ways in which technology tools will be used) is part of curriculum applications planning and will be addressed in Task 4. Only broad objectives for development or improvement need be written at this stage of the TPIS process.

■ *The number of program initiatives proposed by the planning team usually will be dictated by the priorities established in the strategic planning process and by available resources.*

The number of program initiatives proposed by the planning team usually will be dictated by the priorities established in the strategic planning process and by available resources. The planning team might want, however, to develop more initiatives than can be funded with present resources on the contingency that additional resources may become available. The major purpose of program planning is to specify what it will take to accomplish a major improvement objective. The planning team will need to focus limited resources (including limited technology resources) so that a major goal that is important to the district (i.e., addressing an essential student outcome) is addressed and accomplished.

Step 2: Identify target population.

The designation of the target population for the improvement program is essential to focusing limited program management and TSS resources. It is also essential to making decisions about the staging and phasing of the implementation of the program over time (see Step 4). At a minimum, this step involves: 1) selecting a specific target grade level or

levels to initiate the program; and 2) making a commitment to extend the program up through the grades during each subsequent year. This coordinated programmatic approach addresses one of the common failings of many programs: a program improvement is started in elementary or middle school and discontinued at the high school, much like an elective course in music appreciation. This is particularly problematic with respect to technology applications, where resources are limited and applications such as word processing sometimes are implemented at, for example, grades 7 and 8 at the middle school and discontinued at the high school.

The designation of grades or subject areas for an initiation of the program carries with it the requirement that all components of the program plan, including the technology support system resources and applications, be implemented. Thus, for example, staff development for the program can be targeted for those teachers and administrators who will be responsible for initial implementation during year one, with others involved in subsequent years.

This coordinated programmatic approach addresses one of the common failings of many programs: a program improvement is started in elementary or middle school and discontinued at the high school, much like an elective course in music appreciation.

Step 3: List action steps.

The planning team needs to identify the key action steps that should be implemented in order for the program objective to be addressed. Again, this involves specifying the strategies, tactics, and activities that will be used to achieve the objectives as well as the management activities to be addressed at a later step. Typical action steps at this point are: revising curriculum, organizing staff development and training, developing instructional materials, and identifying the types of technology support system resources that will be required.

Step 4: Specify management activities.

Program management is concerned with allocating and supervising activities and resources to accomplish objectives. Management requirements also include attention to such activities as allocating time for development and training, and the staging and phasing of the various action steps that address the program objectives. These requirements should be coordinated with those specifications developed in the technology support system.

At a minimum, the following management components should be addressed in the program plan:

Staff development. Experience indicates that this is the most critical component of any program improvement project, particularly one dealing with technology applications. Inadequate attention to staff development has been cited as the root cause of inadequate implementation in general. It has also contributed to the misuse and underutilization of existing technology and fostered a reluctance on the part of many teachers to even pursue its use. The planning team should review the inventory of staff competencies as a first step in designing the staff development program. Initial training should be targeted to those teachers and administrators who will actually be implementing the program during the start-up or pilot period.

Time allocations and scheduling. Linked to the staff development component, this component includes both time allocations and scheduling for staff development and implementation support for faculty, as well as the allocations and scheduling of instruction targeted to the program objectives and the instructional program.

Staff. The specifications for staff in program planning relate primarily to staff required for the regular education program. Additional teachers may be required or existing teachers may need to be used differently. Specialized staff required for the technology support system itself will need to be specified in Task 5.

Staging and phasing. Program managers will need to decide how the implementation of the key action steps will be accomplished over time. It may be, for example, that only one grade may be addressed at a time, or perhaps even one grade in one school serving as a pilot effort. It is important to assure that the staging and phasing allows for a full implementation of the program over time.

■ *Perhaps the most pressing requirement for the accomplishment of the program objectives is staff development and training.*

Perhaps the most pressing requirement for the accomplishment of the program objectives is staff development and training. The district will need to insure that, if meaningful improvement is to take place, all teachers in the district have the requisite skills to implement the changes. If the strategic planning process calls for relatively major changes in learning outcomes and teaching and learning (as it should), it is likely that teachers will need training and support to change instruction.

Step 5: Identify resource needs.

■ *Staff development is a district-wide responsibility that must be addressed as part of the program plans.*

Program planners will need to identify the resources that are required to implement the program, as distinguished from those that are required to operate the technology support system. The latter are specified as part of that design (Task 5). Thus, for example, all staff development is designated within the program plan and is the overall responsibility of those supervising the implementation of the program. The technology support system may provide some of the staff for training and implementation support, but staff development is a district-wide responsibility that must be addressed as part of the program plans.

The planning team needs to analyze the resources available and decide what is feasible and reasonable within the implementation timeline. They need to examine such resource requirements as time available for training and developing instructional applications, and financial allocations for such items as stipends, substitute pay, new equipment, and trainers and consultants.

Once resources are identified, the team can examine the entire program plan to be sure that resources match and support the major action steps. The team then can ensure that the program plan is linked to other program improvement activities going on in the districts and in schools.

CONSIDERATIONS

- Staff developers need to design much more creative approaches to staff development, including networking teams and groups of teachers for mutual development and implementation support. Administrators and teachers should participate together in training, where appropriate.
- Staff development in technology applications must be integrally linked with staff development for curriculum improvement. It must be aligned with the staging and phasing decisions that are made by the planning team.
- The quality and quantity of research-based information on the conduct of staff development has increased substantially over the last several years. Program planners and implementers designing staff development systems should attend to this information as they design the programs.
- Evaluating training is essential to realizing the yield from the high investment of staff development costs. Staff development evaluation includes attention to:

  1) immediate feedback from participants;
  2) delayed feedback;
  3) the actual acquisition of skills;
  4) the use of those skills in teaching; and
  5) the impact of the use of these skills on student learning.

- The process of staging and phasing, a critical management responsibility, moves the district away from the insurmountable task of doing it all at once, to a carefully defined incremental implementation of the program plans.

TASK 4: CREATE CURRICULUM APPLICATIONS

RATIONALE

Developing curriculum-based technology applications and the action plans that translate the program plans into guides for implementation are at the heart of the TPIS model. The key process in this task is the development of instructional unit plans. It is through integrated instructional units that the proposed benefits of the TPIS process are realized. When technology applications are blended with essential skills in the curriculum, there is the potential for using the technology as a catalyst to a transformation of curriculum and of teaching and learning.

Researchers have added a whole new lexicon to our language on instructional strategies in their descriptions of technology tool applications: Intelligence extenders, microworlds, intelligent tutors, networking and conferences, and multi-media learning and composing environments are the new terms researchers are using to describe these applications. Researchers also cite the importance of creating classroom knowledge communities and knowledge networks, and the creation of "groupware" to support the cooperative work done through and by such networks.

The instructional unit plans and other aspects of the curriculum development process need to be accomplished by teams of teachers and technology resource persons. These teams can identify the major changes that they want to take place with respect to learning outcomes and teaching and learning processes. The technology support system staff must serve the curriculum development committees, helping them to identify and integrate technology applications that advance the desired transformations in curriculum and instruction.

The notion of a separate technology applications curriculum needs to be abandoned; instead, the specific technology competencies must be integrated into the instructional units. The integrated curriculum, focused on procedural knowledge and skills, is an underlying theme of most of the curriculum improvement research and practice. The rationale is that by blending skills instruction with appropriate information, students will

develop independent learning skills at the same time they are mastering facts and concepts. New learning and information technologies can serve as catalysts to support such curriculum modifications.

Given the need to work incrementally and simultaneously on both fronts — curriculum transformation and technology integration — the planning team (and any curriculum development committees that are formed) should consider the use of a commonly accepted instructional planning tool — the unit plan. By building on a task and a product familiar to most teachers, the planning team will be able to extend the typical conceptualization of instructional units to include attention to technology applications, with a special emphasis on tool applications that extend and support incremental transformations in teaching and learning, based on an improving knowledge base in the education sciences. To do this effectively, the unit developers will need to spend time working with curriculum committees on curriculum revitalization.

■
Given the need to work incrementally and simultaneously on both fronts — curriculum transformation and technology integration — the planning team (and any curriculum development committees that are formed) should consider the use of a commonly accepted instructional planning tool — the unit plan.

ACCOMPLISHING THE TASK

Step 1: Develop action plans.

An action plan is a delineation of the specific activities to be completed in the accomplishment of any one objective, including the person or persons responsible, the schedule for beginning and concluding each step, the identification of support services or personnel and any follow through which will be necessary. Several action plans will need to be developed for each program plan, usually one for each of the action steps specified in the plan. As action plans further delineate the activities to be conducted for each program, additional specifications for the technology support system will be identified.

The development of these action plans needs to be coordinated by the person responsible for the implementation of the program plan. Coordination is required to assure that the sequence of activities across all of the action plans is consistent. These action plans, when completed, become part of the program plan they address.

The principal focus of the action plans should be on the development of applications, primarily instructional (e.g., tool applications across subject areas) but also instructional support (e.g., student performance monitoring). The plan should describe the process of developing instructional unit plans that guide actual curriculum-based technology applications. Figure 4.1 contains a sample action plan.

Figure 4.1

Sample Action Plan

Program Objective: Improve students' information using skills through direct instruction in accessing, analyzing, and communicating information in each of the major subject areas.

Action Objective: Provide teachers with training and instructional materials that support the use of the technology to strengthen the teaching and application of information use skills within and across the major subject areas.

Persons Responsible: Technology resource teacher, assisted by consultants from the Regional Information Center and BOCES; curriculum coordinator and department heads from major subject areas.

Figure 4.1 continued

Action Steps	Completion Date
1. Provide awareness to staff regarding the new skills.	9/30/90
2. Prepare sample lessons for demonstration	10/30/90
3. Conduct unit plan develop workshops with selected teachers.	1/31/91
4. Provide skills training workshops for selected teachers.	1/31/91
5. Procure instructional and technology resources for pilot implementation of instructional units.	1/31/91
6. Provide in-class implementation support for teachers participating in pilot project.	3/31/91
7. Prepare documentation report.	4/30/91
8. Develop plan for replication.	6/30/91

Step 2: Develop applications.

There are three broad types of technology applications (Figure 4.2):

Instructional applications of technology to directly support the teaching/learning environment, such as using word processing and databases in various subjects.

Instructional support applications of technology to enhance the interaction between students and resources such as libraries and guidance services.

Management applications of technology to manage the human and material resources of the school, including instructional, personnel, and financial applications.

The focus of TPIS planning is on instructional applications such as those described in Figure 4.3. These applications need to be designed to support the high priority student outcomes identified by the district. These outcomes should address an integrated skills scope and sequence such as that presented in Figure 4.4, as well as the essential information or content of the subject areas. If a comprehensive scope and sequence of student learning outcomes is available, such as the CIMS curriculum specifications, the process of linking technology applications to the curriculum is simplified. The technology planning team and the curriculum specialists in a subject area can make appropriate matches. Figure 4.5 provides an illustration of a skills matrix shell that can be used to guide the selection of appropriate matches between information

utilization skills that need to be addressed in several subject areas and the technology competencies and applications. The shell visually depicts the means by which the curriculum teams can deliberately align skills and prepare a scope and sequence that fits appropriately into the cylinder displayed in Figure 4.4. These matches provide the integrated learning outcomes that can be addressed during instructional unit planning.

Figure 4.2 **Technology Applications for Improving Schools**

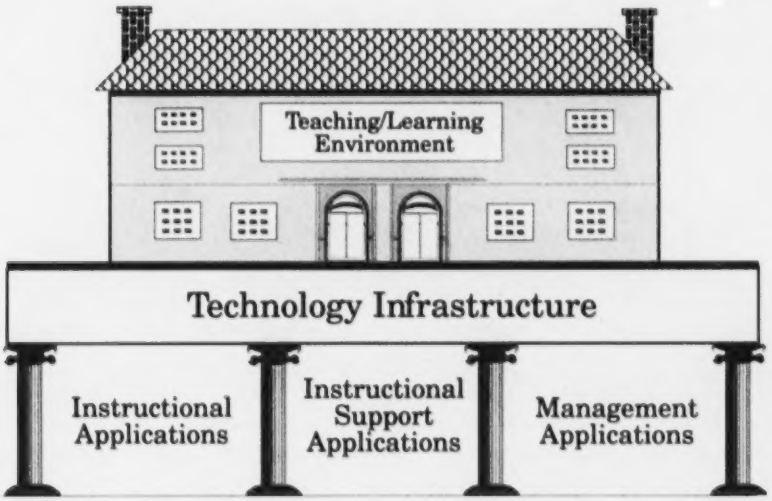


Figure 4.3 **Instructional Applications of Technology**

Computer Simulations. Computers simulations have been used in science, mathematics, and social studies to teach complex processes that can not be conveyed to students within a typical educational setting. Simulations can augment science classroom instruction by permitting students to explore worlds too small, fragile, dangerous, or complex for actual classroom study; or, they can provide unique opportunities for the social studies student to assume the role of a person in a simulated historical event. They can also help students understand the "real world" event or process being modeled.

Database Management. Database management software has been used in social studies and science to allow students to store, update, retrieve, organize, sort, format and perform computations on data. Electronic spreadsheets reduce lengthy statistical calculations. Database software packages can assist students in compiling data from opinion surveys and performing statistical analyses. Most importantly, they provide a concrete means of "if-then" analysis of data so students can actively participate in hypothesis testing, prediction, and model building, the foundation of science and mathematics.

Figure 4.3 continued

Computerized Graphics Design and Music Synthesis. Computer graphics systems that involve the use of "electronic" paint brushes and music synthesizers are new electronic "tools" for students to use to express themselves in art and music. They are even being used to identify/interpret patterns through sight and sound.

Problem-Solving Applications of Technology. Simulations, commercial software, authoring systems, and word processing are used to support the development of critical thinking and problem-solving skills in students. Computer simulations in social studies enhance the development of problem solving skills because they present students with a situation in which a problem exists and provide information to assist in solving the problem. The capacity of word processing to manipulate symbols, words, sentences and data may enhance students' skills of composing, comprehending, responding to literature and critical thinking in languages.

Computer Programming and Authoring. The teaching of programming (typically in the mathematics curriculum) supports the teaching of mathematics facts and concepts and develops a procedural understanding of the fundamental understanding of science and mathematics.

Word Processing. Word processing brings form and polish to the writing process: the computer can store large quantities of text; allow the student to insert, delete and rearrange; match the text against a variety of spelling and punctuation "analyzers"; and assist students in "shaping" and "polishing" their work. Word processing can also enable limited English proficient students whose alphabet is radically different from that of the English language to write more rapidly than would be possible if the student had to first acquire the alphabet and then write without the use of the computer.

Telecommunications. Use of on-line systems for electronic mail, conferencing, and information access.

At this stage in the planning, the scope and sequence specifications guide the development of specific instructional applications. These applications are based on an integration of technology competencies with other cross-subject skills that serve as the core of the curriculum. As the cylinder in Figure 4.4 illustrates, technology competencies can be viewed as one set among several of these sets of cross-cutting skills that are integral to every subject area. In developing program objectives, the planning team must understand how the technology competencies and the other skills can be integrated. Figure 4.6 provides a sample set of technology competencies that need to be integrated into each subject area curriculum.

The unit plan is a device for supporting integrative teaching, for blending the specific knowledge, skills and attitudes of a discipline with the more generic cross-cutting skills (thinking/reasoning, learning/study, information acquisition and use, problem-solving) that need to be

developed in several disciplines. The instructional unit plan is a:

- design for teaching a unified segment or component of the curriculum;
- "bridge" that links daily instruction to the district's curriculum framework;
- road map for preparing daily lessons;
- means of accomplishing integrated teaching of skills and information;
- mechanism for sharing instructional plans among faculty;
- means of incorporating changes in instructional strategies; and
- means for integrating technology tool applications with the skills of each subject area as well as the cross-subject skills dealing with thinking and reasoning, problem solving, communication, information processing and learning to learn (see Figure 4.4).

The unit plan development process provides an ideal forum for staff development and a practical context in which questions about transformations in teaching and learning practices can be addressed. Within this context it is easier to select technology applications that move beyond simplistic drill and practice and tutorial software. Incorporating appropriate technology applications into instructional units is not a casual process, however. The technology resource specialists must be deliberate in their identification of opportunities for technology integration. This process of instructional unit development avoids a common syndrome observed in many districts: curriculum improvement committees working independently from technology resource specialists.

The unit development process has the following characteristics:

- Clear specifications of outcomes in the skill areas
- Careful selection of content
- Direct instruction and applications of skills, both generic and discipline-based
- Focus on real-world problems and learning
- Teacher-developed instructional units

Developing instructional unit plans requires that a few prerequisite steps be accomplished.

1) **The overall purpose of the unit must be clear.** Typically the central purpose of a unit is to have students learn a specific skill or set of skills and related concepts that are judged to be essential to their development. This focus on a skill or set of related skills as the core of the unit may be a minor or major shift in perspective, depending on the grade level and subject area being addressed. For example, reading instruction in the elementary grades is focused almost entirely on skills development, while science instruction at the 10th grade is much more focused on information and concepts, with the process skills of science given less attention.

2) **There must be a clear specification of the "ingredients" to be used in the unit.** That is, each of the sets of skills and concepts must be well defined. There are at least seven sets of

Figure 4.4
An Integrated Skills Scope and Sequence

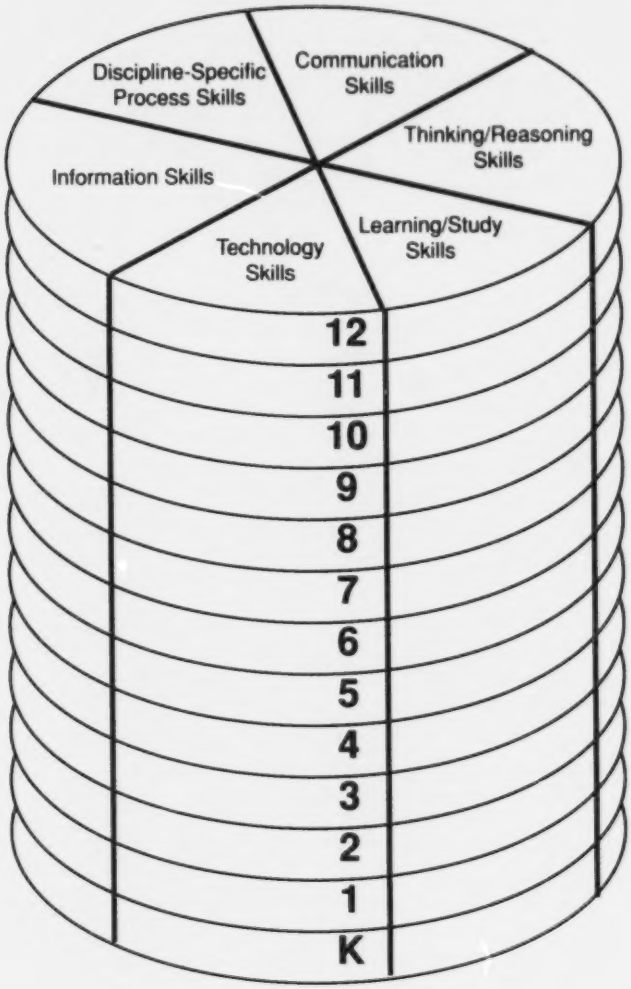


Figure 4.5
A Sample Skills Integration Matrix

GRADE	1	2	3	4	5	6	7	8	9	10	11	12	
INFORMATION SKILLS													TECHNOLOGY SKILLS
data searching													word processing
data storing													database use (basic)
data manipulation													spreadsheet use
information design													spreadsheet design
information agglomeration													graphics design
information synthesis													integrated tool use
information discard													integrated report design
information application													data transfer: text
information reporting													data transfer: graphics
data design													data transfer: sound
database design													data transfer: video
database development													digitization: sound
data verification													digitization: graphics
data rejection													integrated systems use
knowledge application													hypermedia applications
theoretical design													programming
research design													simulation application
data access													telecommunicate
information application													keyboarding

Sample Technology Competencies **Figure 4.6**

Operate computers and other technology tools (e.g., printers, modems, videotape recorders, videodisc players, CD-ROM players).

Use software to acquire information and develop skills (i.e., computer assisted instruction for tutorial).

Use the basic operating system functions of commonly available computers (e.g., disk and file copying, formatting disks, using directories).

Describe how computer languages communicate instructions to computers.

Use word processing and graphics software to prepare a variety of communications.

Use telecommunications systems to access information and communicate.

Use other computer tool software (e.g., databases, spreadsheets, graphics) to process information and solve problems related to all subject areas, as appropriate.

"ingredients" that constitute the content of the curriculum:

a. information, concepts
b. process skills related to the discipline or subject
c. thinking/reasoning skills
d. learning/study skills
e. technology application skills
f. communication skills
g. information processing skills

There is some overlap between some of the bins; discipline/related process skills, for example, are closely related to thinking/reasoning skills. It is possible to distinguish the latter as more generic, serving as a foundation for addressing any set of discipline/specific process skills.

3) **The skills or information in each bin must be organized according to what should be learned first, second, and so forth: the scope and sequence.** The scope and sequence of reading skills at the elementary grades is typically well delineated. The discipline-specific skills taught in secondary school science are usually considerably less well specified. Social studies skills at the late elementary grades fall somewhere in between these two extremes.

Figure 4.7 provides a format for a unit plan.

CONSIDERATIONS

- The successful integration of technology into the curriculum requires that subject area learning outcomes be clearly specified. Moreover, essential learning-to-learn, problem-solving and information use skills must be taught and used in all subject areas. Technology applications skills can then be merged as appropriate into instructional units. When curriculum specifications are not clear

- when there is not a scope and sequence of learning outcomes - it is difficult to integrate the technology competencies appropriately. Similarly, when skills such as those identified in Figures 4.4 and 4.5 are not addressed throughout all subjects, effective technology integration will not yield the expected benefits.

- The development of instructional unit plans needs to be guided by the curriculum improvement process and the district's subject area committees. Technology support staff need to serve as resource persons to these committees. In districts without a curriculum improvement process and structure, technology integration is difficult and the technology skills may remain unconnected to the core learning outcomes in the subject areas. It may be necessary to develop a curriculum improvement process and structure before systematically addressing technology integration.
- Instructional units need to address essential learning outcomes and incorporate teaching and learning processes which promote the development of students who can think, learn and perform in and across the subject areas. Technology applications skills are an essential component of a comprehensive curriculum.

Figure 4.7
Instructional Unit Plan Outline

SUBJECT/COURSE: **GRADE/LEVEL:**

TOPIC:

PURPOSE/RATIONALE:

OBJECTIVES:
INFORMATION/CONCEPTS:

SKILLS-DISCIPLINE-RELATED:

SKILLS-THINKING/REASONING/PROBLEM-SOLVING:

Figure 4.7
Instructinal Unit Plan Outline
[continued]

SUBJECT/COURSE: **GRADE/LEVEL:**

LEARNING/STUDY SKILLS:

PREREQUISITES:
INFORMATION/CONCEPTS:

SKILLS:

INSTRUCTIONAL STRATEGIES
CLASSROOM ORGANIZATION/GROUPING:

ORGANIZATION OF CONTENT:

TEACHING ACTIVITIES:

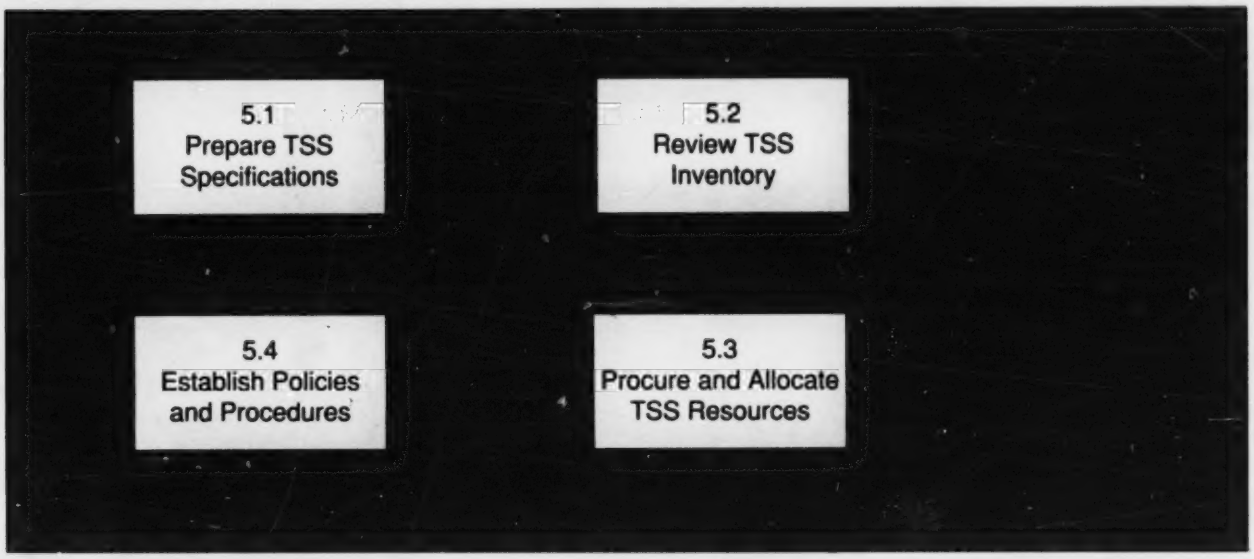
STUDENT ACTIVITIES:

MATERIALS & EQUIPMENT:

MONITORING & EVALUATION:

SCHEDULE:

TASK 5: DESIGN THE TECHNOLOGY SUPPORT SYSTEM



RATIONALE

With the specifications for school and program improvement plans completed, the team is ready to turn its attention to the detailed design of the technology support system. A technology support system is an interrelated set of human and material resources and processes directed to the accomplishment of program objectives. It is important to conceive of the technology support system not as an end in itself, but as a means. The operative word is **support**. The system has no purpose without a connection to ends determined by school and program improvement processes operating in the district and schools. The development of the technology support system is nested within program and curriculum planning, as illustrated in Figure 5.1. The planning team, however, needs to treat it as a discrete task because of its centrality to the planning process and the importance of developing a comprehensive system.

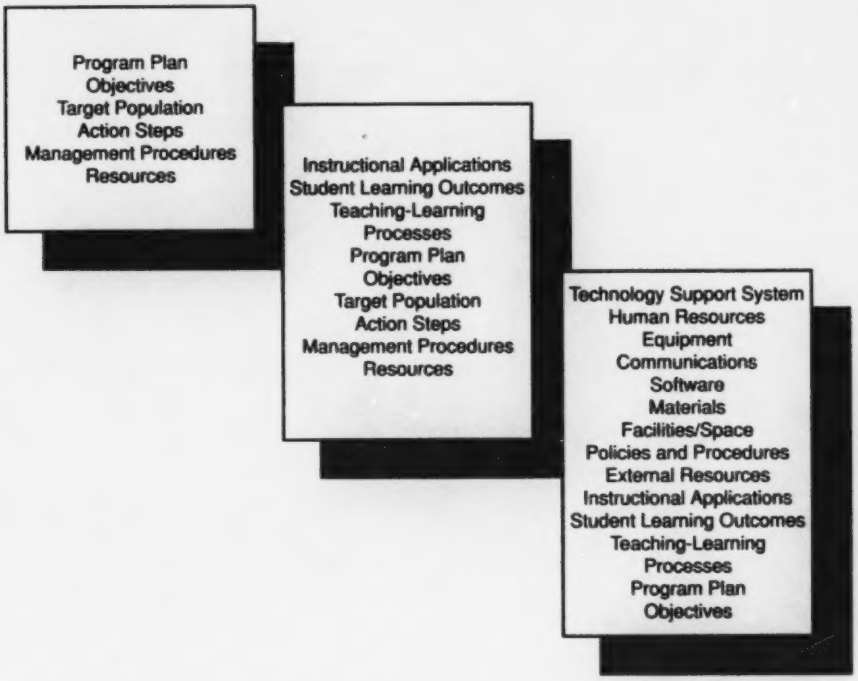
■

The operative word is support. The system has no purpose without a connection to ends determined by school and program improvement processes operating in the district and schools.

The technology support system includes the following components:

Human Resources. Above all, a technology system is based on its human resources. These resources are the trained resource staff that manage and operate the technology support system and provide the assistance to those teachers and administrators developing and implementing technology applications. These people have special skills insuch areas as hardware use, software

Figure 5.1
The Interface Between Program Plans and the Technology Support System



selection, technology applications training, or curriculum-technology applications development. In most districts, technology support system staff operate in a part-time capacity, serving as classroom teachers or district and building administrators with other non-TSS responsibilities. In some districts, external consultants and resource persons served in a quasi-staff capacity to districts and schools. In New York, the BOCES and the Regional Information Centers collaborate to provide training, consultation, and technical assistance to districts and schools.

Equipment. The quantity and quality of technology tools are expanding beyond the capacity of most schools to procure or to use them. The list of new tools, which only a few years ago included only computers, now includes interactive videodisc, CD-ROM devices, local area networks, and even satellite receiving

dishes and other telecommunications equipment for transmitting text, data, voice, and graphics.*

Communications. Global networks and communications systems now provide the means to link students, teachers and administrators at nearly any point on earth. Access to information resources — human as well as material — provides opportunities for expanding learning opportunities and learning at a distance.

Software. Software, in matching the growth in the technology tools, has expanded commensurately, and includes compact discs, videotapes and discs as well as high density digital tape. The range of storage media for programs is increasing nearly as rapidly as the hardware. In some cases, the merge between hardware and software makes the two nearly indistinguishable.

Materials. Often overlooked in the technology system are all of the support materials that are needed to insure optimum use of the tools. These include teacher and student guidebooks and related teaching and learning support materials, as well as blank disks, computer paper, and other supplies.

Facilities and Space. As the tools become more sophisticated and our skills at using them increases, the demands on facilities and space available in most schools increase significantly. In addition to requiring space in classrooms and in labs for computers and other technology tools, attention needs to be given to special requirements for wiring, within and between buildings, for telecommunications support, along with the traditional needs for lighting and air quality.

Policies and Procedures. An essential component of a technology support system are policies and procedures that determine how the system is to be used. Some of these policies are integrally connected to district level policies (e.g., equity), while others are more particular to the system itself (e.g., hardware and software procurement, and software piracy).

External Resources. Districts can tap an increasing array of resources developed at the international, national, Federal, State and regional levels. Programs and resources to support the district's curriculum can be procured from organizations such as National Geographic and Technical Education Research Centers and delivered right into classrooms. Such programs are not merely hardware, software, and communications, but comprehensive teaching and learning environments, with instructional units which accomplish the integrated instruction discussed in Task 4.

■ *The team needs to work between the program plans and the technology support system specifications, matching the requirements of the plan with the capacities, actual and potential, of the technology.*

While establishing a direction and program planning require heavy involvement of staff and stakeholder group members, the task of designing the technology support system needs to be accomplished by

*A glossary of terms is provided in the Appendix.

the most technically experienced members on the planning team. In fact, the planning team may need to tap the expertise of external consultants and to work with vendors of technology support system components in order to insure that a technically sound design is prepared. Even at this planning stage, however, the team should give substantial attention to the educational specifications in the program and curriculum plans. The team needs to work between the program plans and the technology support system specifications, matching the requirements of the plan with the capacities, actual and potential, of the technology. More detailed selection of technology support system components (i.e., software and materials) will need to take place during the development of curriculum plans and applications.

ACCOMPLISHING THE TASK

Step 1: Prepare TSS specifications.

The planning team will need to develop a complete set of TSS specifications for each program plan and curriculum application developed as part of Tasks 3 and 4. The specifications will need to address all components: human resources, equipment, communications, software, materials, facilities/space, policies and procedures, and external resources. It is essential that these specifications include all of the system components that will be needed to contribute to the program objective. The TSS specifications must respond to all aspects of the program plan, not only to those related directly to the instructional program, but to those needed for support of staff development or management support as well.

Since the program planners and subject area committees involved in program and curriculum improvement may not be knowledgeable about the potential of the new technologies, it is important that the planning team and the technology support staff be aware of the potential of various tools for making substantial contributions to a program objective or curriculum application. The TSS staff should be informed about the technologies that are available and their potential for supporting the program objectives and integrating with the desired teaching and learning environments. For example, in examining the program objectives and the curriculum applications, the TSS staff may know of specific applications that are specifically addressed to those objectives. They need to be sensitive to how the technology tools and applications interact with the instructional strategies being used in the classrooms.

■ *The planning team needs to be sensitive to how the technology tools and applications interact with the instructional strategies being used in the classsrooms.*

In preparing the technology design, the team should address these questions:

1) Is a hardware and software selection acquisition process described which employs specific criteria (e.g., technical assistance, match w/curriculum requirements, cost-effectiveness)?
2) Are technology hardware and peripherals appropriate for the curriculum applications that need to be addressed?
3) Is there an up-to-date inventory of hardware and software?

4) Is there a software distribution system that is consistent with, and supportive of curriculum priorities?
5) Is there a system for flexibly allocating equipment throughout the district/school, according to needs and curriculum priorities?
6) Are hardware, software and other technology support system costs calculated/estimated?
7) Have policies and procedures been developed?
8) Have external resources been identified?

The district planning team should take advantage of the technical assistance available from state and regional sources. Information on all of the TSS components is available from BOCES and the Regional Information Centers. These technical consultants can collaborate with school and program improvement specialists in the BOCES to coordinate their support to the design of a technology support system linked to the program plans.

Step 2: Review TSS inventory.

The planning team will need to match the specifications for the TSS in each program plan against inventories and assessments of what is already available in each of the categories. It is unlikely that there will be an abundance of equipment lying in wait for assignment to a program plan. Nor is it likely that considerable new monies will be available for technology resources. Therefore, the team will need to examine all of the TSS resources that are available, even those that are currently being used, and particularly those being misused, underused, or used for low priority objectives. While the inventory analysis will focus on hardware, the team should not limit their analysis to those resources. Often, software and support materials are equally underused.

Step 3: Procure and allocate TSS resources.

The TSS plan will require a detailed specification of the resources, existing and new, that will be allocated to the program plans. The planning team should prepare budget estimates for all new resources in each of the categories. These resource requirements and budget estimates should be organized and presented as part of each program plan rather than in a traditional line item format which summarizes all component costs across all program plans. A program budget format will help decision makers to review resource requirements in the context of priority programs rather than as stand-alone requests for resources. Decision making regarding resources should focus on outcomes to be accomplished in priority areas rather than on the purchase of another computer laboratory or a videodisc player.

Decision making regarding resources should focus on outcomes to be accomplished in priority areas rather than on the purchase of another computer laboratory or a videodisc player.

One of the most difficult responsibilities for the planning team is reallocating technology support system resources, particularly reallocating computers and software. The task is made more difficult because of the common practice of distributing equipment and software

The team must be careful to allocate some equipment to entrepreneurial projects.

throughout the schools without adequate plans for their use. While some of this distribution may have supported desperately needed and exemplary grass-roots, entrepreneurial behavior, it sometimes has resulted in technology resources being unused or underused. In many cases technology support system resources may not need to be moved or reallocated, but merely assigned to an additional or different use or expanded within the same teaching and learning setting.

The team must be careful to allocate some TSS resources to entrepreneurial projects. Indeed, one of the program plans might be devoted to encouraging the development of additional "seed corn" by innovative teachers. The team will need to build in documentation and evaluation components to these entrepreneurial projects, however, so that they do not become islands of innovation or perpetual pilot programs, isolated from the rest of the organization.

■

Policies and procedures may be needed to guide staff in using communications networks and external resources as well as in selecting software and developing instructional applications.

The program planning process requires that, over time, the development and improvement of the technology support system is focused around specific program objectives and improvement priorities. Over time, this practice should reduce or eliminate the purchase of equipment, software and other resources for unclear or low priority objectives. The strategic-program-curriculum planning process should foster more informed judgments about how the technology support system should be improved.

Step 4: Establish policies and procedures.

Just as the district requires statements of policies and procedures to guide its day-to-day actions, so also does the technology support system. Some of the policies need to relate to those at the district level (e.g., equity), while others are specific to the TSS (e.g., hardware procurement, software piracy). The planning team, in developing a draft of policies and procedures for the TSS should assure that they are consistent with, and follow from, the statement of mission and goals for the district's school improvement program. Policies and procedures may be needed to guide staff in using communications networks and external resources as well as in selecting software and developing instructional applications.

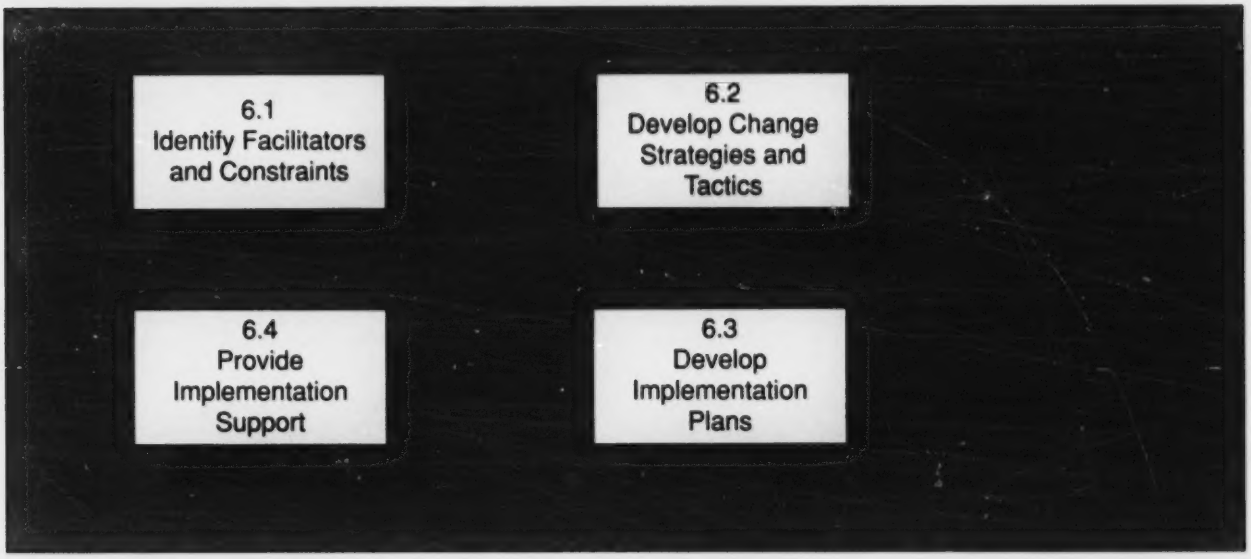
CONSIDERATIONS

- It is a measure of the state of the art that the major issues related to technology applications are no longer exclusively or even primarily technical. Despite the emerging technologies on the horizon — voice recognition, digital-video interactive media, easy and inexpensive access to information and people via telecommunications — educators' attention is increasingly focused on instructional applications, particularly those that support transformation of learning outcomes and teaching and learning.
- Program planning focuses technology applications on district improvement priorities. In using these priorities to determine the

allocation of technology resources and support, planners will need to guard against eliminating support for grass-roots innovation.

- By linking the growth and development of the technology support system to school and program improvement priorities, the planning team will reduce the risk of wasted resources.
- To design exemplary technology applications requires substantial understanding of curriculum and instruction, particularly how the technology can catalyze and support transformations of teaching and learning. These abilities are equally as important as the technical ones.

TASK 6: PREPARE FOR IMPLEMENTATION AND CHANGE



RATIONALE

The burgeoning literature on implementation and change is testimony to the criticality of this task (see the Bibliography). Faulty or inadequate implementation planning and follow-through is cited as the most frequent reason for unrealized expectations in education.

The change process must embody conscious, applied planning as a part of the overall plan. There are two levels of change: institutional and individual. In almost every instance of planning where a paradigm shift is required (and not just a superficial move from one form of development which is outmoded, to another which can be "tacked on" to the past structures) organizations tend to focus most of their efforts and resources on institutional change. This attention is unbalanced: individual change is the most important focus. Unless individuals are helped to change, no paradigm shift will occur and the organizational change will dissipate. Thus, researchers suggest that there are two major areas of focus (in effective staff development): (1) how people change in both their feelings about and their use of new programs, and (2) what processes and characteristics of individuals and settings facilitate or inhibit the change process.

The concerns-based adoption model (CBAM) of change, for example, identifies seven stages of concern (Figure 6.1). In addition to these

Researchers suggest that there are two major areas of focus (in effective staff development): (1) how people change in both their feelings about and their use of new programs, and (2) what processes and characteristics of individuals and settings facilitate or inhibit the change process.

concerns, the planning team needs to consider the stages of the change effort. The earliest stages of planning and development must be

Figure 6.1

Stages of Concern about the Innovation

6 REFOCUSING: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternative to the proposed or existing form of the innovation.

5 COLLABORATION: The focus is on coordination and cooperation with others regarding use of the innovation.

4 CONSEQUENCE: Attention focuses on impact of the innovation on student in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.

3 MANAGEMENT: Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.

2 PERSONAL: Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This included analysis of his/her role in relation to the reward structure of the organization, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.

1 INFORMATIONAL: A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. He/she is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.

0 AWARENESS: Little concern about or involvement with the innovation is indicated.

differentiated from later stages of implementation: Change has not occurred once the plans are implemented; follow-up work and continuing analysis and support are necessary. As the CBAM model suggests, implementation invariably consists of different levels of use. Attempting a

paradigm shift in a complex organization such as a school district requires attention to these levels of use.

ACCOMPLISHING THE TASK

Step 1. Identify facilitators and constraints.

In implementation planning, it is not enough to deal with problems as they arise. The planning team must anticipate difficulties in order to take a proactive stance in addressing them. This often calls for very active listening during all of the opportunities for interaction with staff and other stakeholder groups.

Facilitators and constraints come from several sources. Obviously, the most important source is people. Their individual and collective values, attitudes, feelings, and interactions must be accounted for in planning the change effort. Group norms are powerful factors, but policies and procedures and the organization itself are also a substantial source of facilitators and constraints. Perhaps the most often mentioned constraint with respect to technology planning is insufficient resources.

Throughout the planning process the team should actively develop a list of facilitators and constraints based on the comments of staff and members of other stakeholder groups. They should begin to identify those that are within the scope of the plan and the planning process and those that they cannot address on their own. One important source of information about facilitators and constraints with respect to people is identifying the stages of concern that teachers and administrators have with respect to the implementation of the program. One very structured and analytical process is to monitor the stages of concern that teachers and administrators have with respect to the implementation of the program. Figure 6.1 lists typical stages that persons in an organization go through as they deal with change and innovation. The team can use this analysis to identify where people are in the change process. They can then develop strategies and tactics for dealing with these various groups.

■ *One important source of information about facilitators and constraints with respect to people is identifying the stages of concern that teachers and administrators have with respect to the implementation of the program.*

Step 2. Develop change strategies and tactics.

With an accurate understanding of the facilitators and constraints that exist with respect to the change effort, the planning team can move ahead with the design of change strategies and tactics. Perhaps the most powerful intervention that the planning team can use in dealing with the change process is comprehensive, accurate, and ongoing communication with all involved. The literature provides ample testimony to the fact that the degree of involvement of critical stakeholders is directly related to the degree of their involvement and commitment once the plan is completed.

■ *Perhaps the most powerful intervention that the planning team can use in dealing with the change process is comprehensive, accurate, and ongoing communication with all involved.*

Change strategies need to reflect both the nature of the changes that are being advocated as well as the organizational setting and the people in that setting. Nevertheless, there are some general principles which the team might want to deal with as it prepares its change strategies and tactics. One of the most difficult problems the team will face is how to achieve a balance between moving slowly enough to bring along most of the staff and moving quickly enough to actually get something done. The strategy that appears to work best is to work incrementally within a grand

■
Experience indicates that the most critical variable at all stages is training and support.

design and to move flexibly within an overall structure for the change. The planning team will need to work with district level administrators to assemble a package of incentives that move people toward the innovation. Experience indicates that the most critical variable at all stages is training and support.

Change proceeds through four stages:

- innovation (which involves developing a general understanding of the model and its supporting theory);
- incubation (which involves training individual staff at each site to develop a more specific understanding of the model and its elements and to begin to use the model in their school);
- implementation (which involves the continued use of the model by the individual staff at each site and the dissemination by those staff of the concepts of the model to other staff in the building); and
- institutionalization (which involves use of the model by all the staff at the building site under the leadership and support by those individual staff who pioneered its use).

■
Four stages of change: innovation, incubation, implementation, and institutionalization.

Working with district and building level administrators, the planning team members should identify a number of specific strategies that will address the facilitators and constraints they identify. When considering change strategies, the process of planning includes two perspectives:

1. The focus on the clientele (or the who of the process)
2. The focus on timing (or the what of the process)

The following items must, therefore, be considered:

1. The PrePlanning Stage

Communications

- Information dissemination design (i.e., the communications system to be used during the coming process)
- Information definition (i.e., what will be disseminated?)
- Clarity of purpose in the information to be disseminated (i.e., a careful analysis of every communication to make sure that obfuscation and ambiguity are minimized).

People Focus

- Analysis of support agents at all levels
- Analysis of opposition at all levels

Strategies

- Develop a planned information dissemination application which describes, precisely, what you are doing and why you are doing it (based on internal, external, theoretical, and applied information). Develop timelines for dissemination and also a series of response approaches so that the clientele can give opinions and their own sources of information.
- Collect the support groups together and give them authority by encouraging greater participation (committee work, planning involvement, individual response time, etc.). Encourage them to talk among themselves and provide them with incentives for participation.

2. The Planning and Implementation Stage

Communications

- Continue the process with greater involvement and representation across the board on the planning groups.

People Focus

- Linkage establishment (i.e., who works with whom and what positive influences can be tapped? Also, what negative influences should be countered?)
- The formal establishment of incentives for innovation
- The analysis of tensions within the district and ways to alleviate them
- The prior history of change in the district

Strategies

- Encouragement strategies:
  - The application of incentives
  - The involvement of supporters
  - The expansion of communications
  - The use of cooperative groups (e.g., Model Schools)
  - The use of classroom visiting
  - The creation of "experts"
  - The development of interactive liaison groups
  - The development of response groups
  - The development of basic training models (e.g., as developed through BOCES)
- Coercive or mandated strategies
  - Setting up required staff training objectives
  - Setting up required teacher/aids/administrators skills' levels
  - Setting up required entrance qualifications for new teachers /aid/administrators
  - Setting up required skills' levels for students in which teachers must participate

Monitoring

It is essential from the point of planning onwards that an individual and implementation monitoring program be set up. The change process must be both proactive and reactive. The monitoring program must look for developments and breakdowns in relationship building, for support and opposition to planning procedures and eventually for support and opposition to implementation strategies.

3. The Post Planning/Implementation Stage

Evaluation

- Based on stated and defined objectives and measurement
- Measurement based on documentation, observation, and interview
- Include ongoing results of the monitoring program

Strategies

- Implementation of:
  - further incentives for permanent change
  - applied sanctions for continued opposition to change
- Flexibility and reward for individual incentives based on the overall goals of the planning process

- Empowerment of support groups in the further development of improved schooling.

The New York State Education Department can assist with evaluation for replication through the validation process.

■ *The planning team should arrange training activities so that teachers and administrators are being trained when the equipment and other resources are available and the program is ready to be implemented.*

Step 3. Develop implementation plans.

Each program plan should have a clear specification of staging and phasing, that is, a sequence and time line for implementing the new program. The implementation plan should deal with the allocation and supervision of all resources, including time, training, consultants, and dollars. The planning team should arrange training activities so that teachers and administrators are being trained when the equipment and other resources are available and the program is ready to be implemented. Implementation support should be addressed to the levels of use that teachers and administrators are making of the program itself. Figure 6.2 provides a framework for analyzing the levels of use. The team can devise different kinds of support depending on the needs of teachers and administrators. Figure 6.3 provides a selection of interventions based on the concerns that are typically identified.

Step 4. Provide implementation support.

Experience indicates that the most powerful implementation support for teachers and administrators is actual demonstrations in their own setting. Thus, for example, consultants or expert practitioners should work with teachers in their classrooms, demonstrating and practicing the new behaviors that are associated with the change. This is particularly important with respect to technology, where the introduction of a computer or other new technology tools can provide the opportunity for a substantial change in instructional strategies and classroom environment. Most teachers will need assistance in making the transitions that are part of this process.

The plan should detail how the team and the TSS staff will provide implementation support to all of the teachers involved in each of the program plans. The team members can examine the entire program plan to be sure that resources match the major action steps. They then can ensure that the program plan is linked to other program improvement activities going on in the district and schools. It is this linking which is so critical to the process and which can only be accomplished by starting with applying the technology to the priority improvement needs of the districts and schools.

CONSIDERATIONS

- Technology integration through the unit plan development process requires an incremental implementation process. The units require considerable staff time to develop and pilot test. Employing an incremental approach reinforces the message that the district leadership see technology integration as part of an ongoing process of transforming the curriculum and the teaching and learning environment.
- Collect feedback on the implementation process. The planning team should use a variety of formal and informal processes to monitor

implementation. Often, conversations with teachers can yield valuable information about areas needing attention.

- Allocate time for staff training. One of the most neglected aspects of the technology integration process is providing sufficient time for teachers to develop the instructional units that are at the heart of the process. This development time also provides opportunities for teacher growth and development - growing staff while the works gets done.
- While high quality tools for analyzing the change and implementation process are essential, they should not be a substitute for insightful leadership. Technology applications planning and development is a people changing process of substantial dimensions, and will fail unless basic leadership responsibilities - vision, motivation, recognition, and support - are fulfilled.

Levels of Use of the Innovation **Figure 6.2**

VI RENEWAL: State in which the user reevaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

V INTEGRATION: State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.

IVB REFINEMENT: State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.

IVA ROUTINE: Use of the innovation is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.

III MECHANICAL USE: State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged is a stepwise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.

II PREPARATION: State in which the user is preparing for first use of the innovation.

I ORIENTATION: State in which the user has recently acquired or is acquiring information about the innovation and/or has recently explored or is exploring its value orientation and its demands upon user and user system.

O NONUSE: State in which the user has little or no knowledge of the innovation, no involvement with the innovation, and is doing nothing toward becoming involved.

Figure 6.3

Concerns-Based Tools for School Improvement
Stages of Concern Interventions

Stages of Concern 1: Informational

Communicate why change is being made.
Make rewards clear.
Provide information about the issues of specific interest.
Share realistic expectations about implementation.
Group people with similar needs/concerns and provide information.
Focused school visits.
Provide information to parents, community, and others.

Stage of Concern 2: Personal

Allow input into the process whenever possible.
Create collegial sharing opportunities.
Give a picture of the person in the role of user.
Provide a forum for exchange of concerns.
Validate concerns, list and address at some point.
Create and communicate realistic expectations.
Meet in small groups to share concerns.
Brief/train administrators.
Work to get community, parent support, and involvement.
Provide continual positive feedback.
Give alternative ways to do things.
Dispel hidden agenda impression.
Break up resisters into small workable groups.

Stage of Concern 3: Management

Show/demonstrate how procedures differ or are similar to current practice.
Allow for personal style.
Ensure people that materials, etc.,will be there, then follow through.
Share best lessons, how problems dealt with.
Try out techniques for integration, share materials, practice.
Present demonstration, video.
Classroom and time management techniques
Have consultant work with principal to provide support.
Have consultant available at specific time for help.
School visits
Identify internal leadership/support tasks.
Provide time to plan and work together.
Free people up from other responsibilities.

Stage of Concern 4: Consequence

Recognize successes.
Assess impact on kids, or provide different ways to do so.
Discussions of other ways to meet kids' needs
Peer observation

Develop self evaluation model.
Give time to work together on solutions.

Stage of Concern 5: Collaboration

Find the time for meetings; rearrange schedules.
Structure time together.
Provide rewards for working together.

Figure 6.3 continued

TASK 7: EVALUATE PERFORMANCE AND EFFECTIVENESS

RATIONALE

The rationale for a comprehensive evaluation plan for each program plan, including technology applications, is based on two requirements:

1) accountability to the community requires timely reporting on the quality and effectiveness of the curriculum-based technology applications; and
2) improving the technology support system and technology applications needs to be guided by information on the appropriateness and effectiveness of the technology in supporting the accomplishment of specific learning outcomes and the instructional strategies used to accomplish them.

There are several specific requirements to which the evaluation design should respond.

1) Teachers and administrators should be involved in the development of the evaluation design.
2) The evaluation methods and instruments for assessing the appropriateness and effectiveness of the technology applications should be part of the overall program evaluation process in the district.
3) There should be an ongoing assessment of students' performance on the technology competencies as they move through the skills matrix (see Figure 4.5), just as there is for all of the skills in the curriculum (see Figure 4.4).
4) An overall evaluation of the effectiveness of the technology support system should be conducted.

The evaluation plan should include a description of methods, instruments and procedures, and implementation time frame and a

■

Four evaluation questions:
- *design*
- *implementation*
- *mastery*
- *effectiveness*

specification of the decisions and actions that are to be made based on the evaluation. The evaluation must respond to four questions:

1) Is the **design** for the technology support system and its applications adequate?
2) Are the technology applications being **implemented** as planned?
3) Are students **mastering** the skills competencies specified in the skills matrix?
4) Are the technology applications **effective** in contributing to the accomplishment of learning outcomes in the subject areas?

The first of these questions is addressed by the planning team during the program planning and curriculum applications tasks. It is assumed at this point, therefore, that the program design, including the technology support system, is adequate. Thus, the latter three questions should be addressed in the evaluation.

ACCOMPLISHING THE TASK

There are three major steps in preparing a plan for evaluating the technology support system and applications. They address the questions stated above.

Step 1: Review the implementation of the system and applications.

■

Teachers' judgments are the most valuable source of information for refining implementation activities.

One of the areas that appears to be most neglected in the development and evaluation of technology support systems is some systematic assessment of whether the essential elements of the TSS and the technology applications are being implemented as designed by the planning team. It is important for the planning team to listen to the judgments of the classroom teachers regarding the use of the technology applications in the classroom. Teachers' judgments are the most valuable source of information for refining implementation activities. Their assessments can also indicate what additional training and support they need in order to integrate the technology applications effectively.

Reviewing the implementation can be accomplished in several ways. The two most common are observations and document review. Observations can be accomplished through self-monitoring or by peer or supervisor observation. Such observations usually take the form of checklists that track important objectives or instructional strategies. The purpose of the checklist is to determine the degree of implementation of the technology applications. The observation checklist must not be used as an instrument to evaluate teacher performance, but to focus on what is and is not working, and on what support teachers need.

Document review typically involves the examination of teachers' plan books or lesson plans. The development of instructional unit plans provides the most comprehensive documentation of the implementation of technology applications according to the skills matrix design (see Task 4, particularly Figure 4.5). The development of unit plans provides teachers with the opportunity to deal with the practical aspects of implementation as part of the staff development program.

Step 2: Monitor student performance.

The tracking of student performance on the technology competencies is one of the most difficult aspects of the evaluation requirement. This is because the overwhelming percentage of technology competencies are skills oriented and are not amenable to assessment through paper-and-pencil instruments. Instead, teachers and administrators must observe students using the technology tools to accomplish the curriculum objectives.

The overwhelming percentage of technology competencies are skills oriented and are not amenable to assessment through paper-and-pencil instruments.

One of the methods that has been found most useful in tracking student mastery is to establish checklists that students can use to monitor their own performance and that of other students. Peer tutoring and assessment can be combined to assure that all students are mastering the technology competencies that are expected to help them master the outcomes of the curriculum in and across the subject areas.

Student performance monitoring information must be linked directly back into instruction. The information must be useful to teachers in refining their instructional techniques to assure that all students have mastered the competencies. Here again, the use of self-monitoring and peer-monitoring processes can help the students discover for themselves what they do and do not know and arrange their own self-learning accordingly.

Step 3: Evaluate effectiveness.

This process needs to be concerned with the summative judgments regarding the contribution that the mastery and use of the technology competencies makes to the overall accomplishment of the core learning outcomes in and across the subject areas. Districts cannot be expected to set-up costly research designs to assure that this is so. Instead they need to focus on teacher and administrator judgment based on observations and other performance data. Observation and interview guides provide administrators and teachers with standards to use in conducting observations and making judgments. An example of a such an evaluation guide is provided in Figure 7.1.

A Technology Applications Evaluation Guide

Figure 7.1

Are the priority learning outcomes of the curriculum being addressed?

- What contribution is the technology making to the accomplishment of the learning outcomes?
- Are important learning outcomes being addressed?
- Is the application dealing with higher order skills?

Are the learning outcomes themselves enhanced because of the use of the technology?

- Is the technology application improving the curriculum, either by dealing with essential learning outcomes or by using innovative instructional strategies?
- Has the teacher begun to rethink his/her instructional priorities because of the technology?
- Is there increased attention to real-world reasoning and problem-solving skills and processes?

Figure 7.1 continued

Is the focus of the application on the learning outcomes as the ends, with the technology as a means?

- Is the teaching about the computer or other technology tool the secondary focus, with primary attention given the important learning outcomes?
- Does the teacher reinforce the concept that the technology is an important means, but a means nevertheless?

Is the technology tool being used to accommodate individual differences in learning rate and style?

- Is the technology creating more independent learners?
- Is the technology providing a challenge to the more able students?
- Has the use of the technology enhanced the teacher/student relationship?

Is the technology extending the learning productivity of students and teachers?

- Are students accomplishing more learning in the same time?
- Is there an increase in the teacher's productivity? Is the teacher able to bring about student mastery more quickly? Teach difficult concepts more easily?
- Has the technology application prompted the teacher to expand her/his repertoire of instructional strategies?

Does student performance information indicate that the technology contributes to increased achievement of learning outcomes?

- Are the learning outcomes being assessed through student performance?
- Is there evidence to show that the use of technology contributes to improved mastery of the learning outcomes?

CONSIDERATIONS

- Evaluation information must be aimed at improving the quality of the technology support system and the technology applications. Those responsible for the evaluation must be sensitive to the nature of the evaluation outcomes and be able to effectively use these results to bring about change. The planning team should have a process in place that will provide for the interpretation and dissemination of the evaluation information.
- Use multiple sources of information. Given that the evaluation will not rely on norm referenced or standardized tests for much of its evaluation, the team should advocate the use of multiple methods and instruments for obtaining evaluation information.
- Prepare communications for all stakeholders groups. While the primary recipients of evaluation information, particularly of a formative nature, are the teachers and administrators in the schools, all of the stakeholder groups should receive information from the evaluation, particularly with respect to overall effectiveness. The planning team will need to specify in the plan what information

needs to be communicated to the various constituent groups represented by the planning team or involved in some of the planning activities.

- The planning team needs to prepare a set of analyses and recommendations that follow from the evaluation and feedback into the strategic, program, and curriculum planning processes. At least once a year the planning team can conduct a formal review of the strategic direction. The team can examine any changes in the internal and external environments since the development of the strategic plan, question whether some of the assumptions still apply, and determine whether the mission statement and the strategic goals continue to express the vision of the schools with respect to the use of technology to support school improvement and a revitalization of teaching and learning.

TECHNOLOGY PLANNING FOR IMPROVING SCHOOLS (TPIS)

Checklist of Tasks and Steps

1.0 Develop a Planning Structure and Process.

- 1.1 Identify stakeholders
- 1.2 Form planning team
- 1.3 Establish planning process
- 1.4 Develop plan format
- 1.5 Identify planning resource needs

2.0 Establish a Direction.

- 2.1 Develop a statement of beliefs and values
- 2.2 Create a mission statement
- 2.3 Examine the information base
- 2.4 Develop strategic goals
- 2.5 Establish priorities

3.0 Develop Program Plans.

- 3.1 Develop program objectives
- 3.2 Identify target population
- 3.3 List key action steps
- 3.4 Specify management activities
- 3.5 Identify resource needs

4.0 Create Curriculum Applications.

- 4.1 Develop action plans
- 4.2 Develop applications

5.0 Design the Technology Support System.

- 5.1 Prepare TSS specifications
- 5.2 Review TSS inventory
- 5.3 Procure and Allocate TSS Resources
- 5.4 Establish policies and procedures

6.0 Prepare for Implementation and Change.

- 6.1 Identify facilitators and constraints
- 6.2 Develop change strategies and tactics
- 6.3 Develop implementation plans
- 6.4 Provide implementation support

7.0 Evaluate Performance and Effectiveness.

- 7.1 Review implementation of the system and applications
- 7.2 Monitor student performance
- 7.3 Evaluate effectiveness

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GLOSSARY

CD-ROM. Compact Disc-Read Only Memory. The disc can store approximately 650 megabytes of data or images. It requires a special player and must be connected to a computer for access and display.

CIMS. Comprehensive Instructional Management System is a program of the New York State Education Department with four components: curriculum (a scope and sequence of learning outcomes based on the New York State Syllabi), criterion-referenced assessment, instruction and staff development.

Competency. The ability to demonstrate a performance at a specified level of accomplishment. Can refer to knowledge, skill and attitude objectives.

Instructional program improvement. Includes attention to three components:

> **Curriculum.** The specification or documentation of learning outcomes and the instructional strategies used to accomplish the outcomes. Learning outcomes specify what we want students to know and be able to do. Instructional strategies describe how we want to accomplish the learning outcomes.
>
> **Instruction.** Teaching that addresses the outcomes and strategies specified in the curriculum.
>
> **Management.** Deals with the allocation and supervision of personnel, time, facilities, and other resources in support of curriculum and instruction.

Interactive Videodisc Player. A device for displaying images stored on a plastic disc which can hold approximately 54,000 images as well as sound and data. The player can be used as a simple stand-alone display device or can be controlled by a computer to organize and manage the display.

Local Area Networks. Communication networks linking computers in a room or building for the exchange of programs and data files.

Model Schools. A program of the New York State Education Department supporting the use of technology tool applications across the curriculum. The program provides staff development, model lessons, electronic conferencing, and related support services.

Satellite Receiving Dish. A device for receiving broadcast signals from geosynchronous satellites. The dish provides access to learning resources available globally.

Technology Support System. An interrelated set of human and material resources and processes directed to the accomplishment of school and program improvement.

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